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CAR ACTION

THE WORLD'S LEADING R/C CAR MAGAZINE

AUGUST 1993

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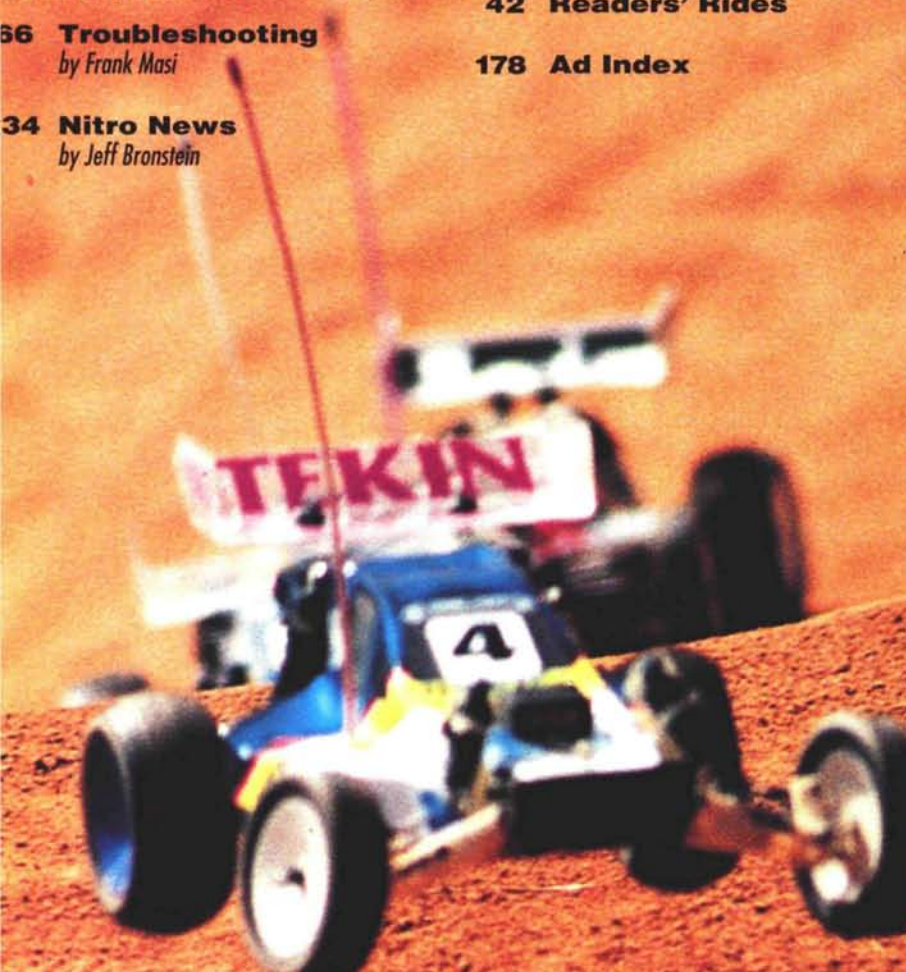
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EDITORIAL

GUEST EDITORIAL BY JEFF BRONSTEIN

THE RAPTURE OF R/C

I'VE BEEN lucky enough to try just about every kind of R/C racing. Most of it I enjoyed; some, not as much. I've traveled to every corner of the world to participate in large and small events, conventions and races. I've watched racing legends lose with dignity, and I've seen the Cinderella stories come true.



When he's not busy being a *Car Action* contributing author, Jeff Bronstein is an avid, 1/8-scale-gas, on-road racer. He had his first gas off-road experience at the recent '93 Gas Challenge race in Hemet, CA. Here, he does his version of color commentary.

In all my R/C experiences—racing, reporting and reviewing—I've seen and done just about all there is to do, and I've observed something along the way. Without a doubt, some of the finest people are R/C racers. I mean it; there isn't a group anywhere I'd be more proud to call my friends. From the rugged old eccentrics like George in Hemet, CA (who tirelessly sets up the track as if it's in his own backyard), to the weary but devoted hobby-shop hands like Rich in Albuquerque, NM (who loves racing but puts everyone else's problems ahead of his own); from the crazy, fun-loving, yet highly professional staff of the premier R/C racing magazine (who could that be?)—who are surely responsible for putting R/C racing on the map—to the professional jokers in Dallas, TX, who really know how to make every visitor feel at home, these people, and all like them, deserve to be thanked and fully appreciated for making the sport/hobby just a little more extraordinary. It's the people as much as the R/C cars that make this hobby enjoyable.

Our hobby attracts a certain kind of person, and it breeds a carefree, friendly attitude. If racing is your only reason to participate in R/C, you could be missing the opportunity to make some of the best friends you'll ever have. No matter where I go, I always take time out of my busy racing and reporting schedule to meet as

many of the local characters as possible. I've never met a fellow enthusiast I didn't like, and a few of them, I consider my very best friends. So, don't miss out on one of this hobby's biggest and best resources. Racing is even more fun when you take the time to appreciate all the people who make it great.

See you at the track!

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NEWS

MRC/Trinity Dash for Cash for World Scale Off-Road Big Prizes, Big Bucks!

All across America, five-week World Scale racing programs are proving the extra ruggedness and high-level performance capabilities and accomplishments of MRC's Thunder King, Desert Thunder and Baja King with racers at every level of experience—from beginner to all-out pro. But the big news this month is the announcement of the MRC/TRINITY DASH FOR CASH FOR WORLD SCALE OFF-ROAD. From September 17 through 19, at the world-famous Ranch Pit Shop in Pomona, CA, these World Scale events—cosponsored by MRC and

Trinity—are sure to be the focus of major R/C—media attention.

Rumor has it that this heavy

racing weekend is expected to attract most of R/C off-road racing's most colorful drivers, including the likes of Joel "Magic" Johnson, Jay Halsey, Derek Furutani and Rick Hohwart. All four World Scale rule-book events will be run, and the races are open to anyone—ANYONE—who has an MRC World Scale Baja King, a Thunder King, or a Desert Thunder. Lots of prizes and big, BIG bucks are in store for the winners over the three-day September weekend. More than \$6,000 in cash will be awarded, including a \$2,000 first prize in the World Scale Unlimited Truck Class. This is a major event!

You don't have to be an expert to take your shot at the MRC/Trinity Dash for Cash for World Scale Off-Road big money prizes. As you probably know, World Scale's Sport Class rules make box-stock World Scale trucks and buggies every bit as competitive in their own class as a fully modified vehicle would be in the Unlimited Class. Beginners are welcome to compete; the Sport Class gives everyone a fair chance at the gold. Besides, the pros will be racing only in the Unlimited Class! Write to MRC for your personal, free copy of the World Scale Racing Rule Book, and, for registration information, write to the Ranch Pit Shop, 1655 E. Mission Blvd., Pomona, CA 91766; or call (909) 623-1506.

BULLETIN! Official World Scale T-shirts are now available from MRC, 200 Carter Dr., Edison, NJ 08817. Small, medium, large and extra-large shirts are \$12, and extra-extra-large shirts are \$14. These are high-quality, 50/50 white tees with colorful artwork that features World Scale logos and the Baja King in action!

If you're planning a trip to Southern California in September, don't miss the MRC/Trinity Dash for Cash for World Scale Off-Road. It will be huge!

ADVERTISEMENT

LETTERS

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Letters," *Radio Control Car Action*, 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and brevity, and each must include a full name and address or telephone number so that the identity of the sender can be verified. We regret that, owing to the tremendous numbers of letters we receive, we can't respond to every one.



COMIC RELIEF

My name is Richard Tanner-Tremaine and I am 18 years old. I have a few things to ask and say.

First, my friend and I have identical cars, but he always wins. Why? Also, which is better, Novak or Tekin? The reason I ask is because I own a locally built speed controller to which I applied full power, and the next thing I knew, I had a fire.

Something I feel I should state at this point is that Chris Chianelli is my idol. By the way, what do you do with the cars when you're finished reviewing them? Can I have one? Please write back to me and give me information on how you can send one to me (I don't buy every issue). If this is a problem, please call me at —.

Perhaps you could discuss how to gear on-road cars such as the TRC Lynx and the Bolink California Flyer for course racing (I believe it's different from oval racing). This would be a great help, since no matter how big I make my pinion gear and how small I make my spur, my car just doesn't seem to keep up with the rest of the racers.

Last of all, I have raced against Cliff Lett and Joel Johnson on several occasions but have never won. Why? Could it be because I don't have the right batteries? I run 1200 SCs that are less than 2 years old which I try to keep in the best possible condition: I used only a 20W soldering iron when buiding my pack, I used acid-core solder, I never discharge my batteries more than how they come out of my car, I never charge them for more than 45 minutes, and I always make sure that I have an ice pack handy in case they get hot enough to melt the solder on the connectors.

Please be sure to do your best and answer as many questions as you are able (perhaps a team effort is in order?). By the way, your magazine is expensive in South Africa. Oh yeah, it's not too bad either.

RICHARD TANNER-TREMAINE
Westville, Natal, South Africa

O.K. Rich, here's the deal. (We see you're an avid reader of the Top 10 Things We're Tired of Reading in Letters, May '92)

1. Your friend keeps beating you because he's faster.

2. As for which is better between Novak and Tekin, take one of each, have your friend drop them on your head from the top of a one-story building, and whichever hurts the most is best for you.

3. No comment on the fire—you weren't holding it at the time, were you? That would explain a few of our questions.

4. We showed this letter to Chris—sorry, but when he saw it, he ran away screaming.

5. What do we do with the cars when we're done reviewing them, you ask? We're gonna give them to your friend who keeps beating you!

6. I tried writing to you, but I was constantly afflicted with a mysterious hand cramp. I had the same problem anytime I tried calling you, too. But you want to know the weird thing...it only happened when I tried writing or calling you! Uncanny, isn't it?

7. As for your on-road car dilemma,

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SCH1393	47 tooth clutch bell, Nitro Daytona	NEW
SCH1394	53 tooth clutch bell, Nitro Daytona	NEW
SCH1397	crank driver, use when pullstart is removed	NEW
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SCH229	95T spur gear, 48 pitch	4.50
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SCH326	89T slipper spur gear, 48 pitch	5.35
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CAR Tires, these are pairs.

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SCH6531	Cat Rr tires, 8x10 Cut spikes, 2.2 car Blue	9.95
SCH6532	Cat Rr tires, 8x10 Cut spikes, 2.2 car Green	9.95
SCH6535	Cat Rr tires, 22x34 Micro-spk, 2.2 car Blue	9.95
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SCH6554	Foam tires Mounted, 2.2 aerodisc Fr	19.95
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SCH1089	Truck 2.2" rims, Natural	pair...6.75
SCH1147	Aerodisc 2.2" rear car rims	pair...5.75
SCH1148	Aerodisc 2.2" front car rims	pair...5.75
SCH1228	Front car rim, Narrow front	pair...4.50

See Our Ad
on Page 146

keep adding more cells to your battery pack until you get the speed you need. That should do it.

8. Gee, neither Cliff nor Joel seem to remember racing against you—ever. You do need better batteries, though. Have you tried the new Sears Die-Hard lineup yet? They're a little on the heavy side, but hey, who knows, it might work for you.

9. As for your soldering and battery maintenance tips—yeah, A-Main all the way, buddy. Try putting that ice pack on your head.

10. Oh, thanks for the "sorta" comment on the mag. And by the way, we really got a kick out of your letter.

JH

R/C OPERA ACTION?

I am perhaps not your typical reader or R/C enthusiast. I earn my living as an operatic tenor and am fortunate to ply my trade throughout this country and Europe. I have just returned from a 6-week stay in France, singing in many cities in that country. I was very interested to read French radio-control publications and get some idea of the extent of our wonderful hobby as practiced in that country. It would appear that R/C is quite popular in France, with 1/10- and 1/8-scale gas-powered cars gaining significantly in popularity—just as it appears is the case here. There are many tracks in France and racing is a well-loved hobby in that country. I was even surprised on one recent occasion to see a television segment on a young French R/C builder and racer. It was fun to see R/C cars in action on video; we need more of this kind of coverage in this country.

I have just completed construction of an Outlaw Rampage truck and am awaiting the arrival of good weather to test its performance.

Many thanks for a good publication, which I look forward to purchasing and reading regularly. I particularly enjoy articles on gas vehicles and the technical information given about them. I'd like to see even more!

JOHN P. SHACKELFORD
Woodbury, CT

Thanks for the kind words...and you guys say we don't got no culture.

LA

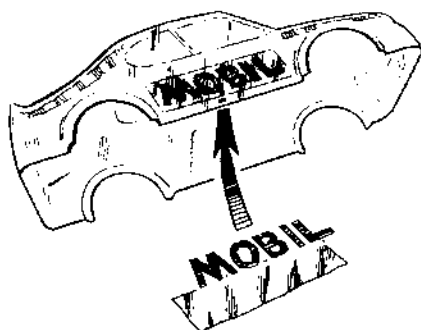
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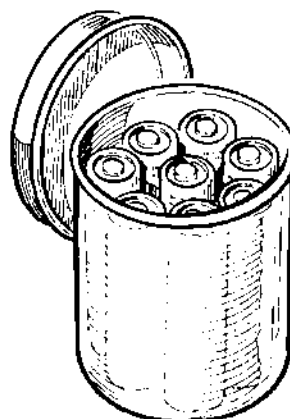
by JIM NEWMAN



PROTECTED DECALS

You can protect your own cut-out, promotional decals or your favorite pictures by putting them on the *inside* of your car. Use a sharp hobby knife to cut out the letters or pictures, and apply them face-up to the sticky side of a strip of clear tape. Then, stick the tape to the inside of the body before you paint it.

David Raffensperger, Merion, PA



SAFE AA CELL STORAGE

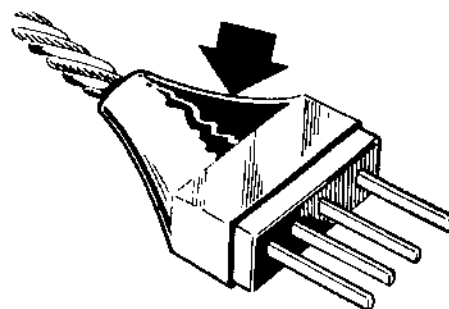
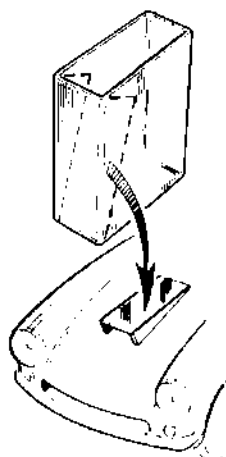
Store your charged replacement AA cells in a closely fitting, plastic pill container. This way, they won't roll around in your tool box and short out against metal objects.

*Craig Perritt,
Westville, Natal, S. Africa*

PLASTIC AIR SCOOPS

Here's an easy way to make a simple, functional air scoop. Remove the top of a Tic Tac case or a similar container, and draw two dotted lines on each side, as shown. Then, cut off and paint the marked section, and, attach it to the hood or sides of your car's body.

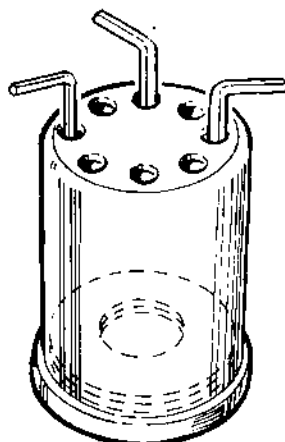
J.T. Faw II, Richmond, VA



DEANS POWER PLUG FINGER GRIP

Shrink a piece of heat-shrink tubing around the plug body and wires, making sure that it firmly grips the twisted wires. This will provide support for the wires and will give you something to grip when you remove the plug from its socket.

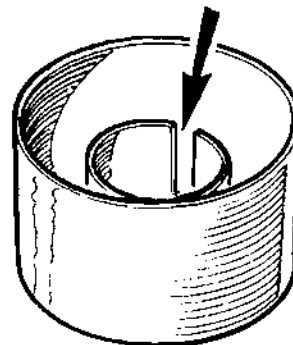
Gary Behrens, La Crosse, WI



ALLEN WRENCH CADDY

Invert a plastic 35mm film container and drill a number of holes in the bottom that are just large enough to hold your Allen wrenches. Put some heavy washers in the lid for weight, and then press modeling clay on top of them. The clay holds the washers and grips the keys so that they stay in place.

Jason Martinez, Flagstaff, AZ



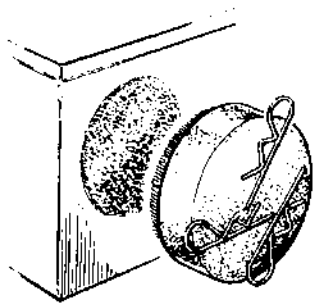
EASY-FIT SPRAY CAN LID

Many spray cans have tops that fit very tightly. To loosen them so that you can remove them easily, cut a 1/4-inch-wide slot in the center cap, as shown.

*Brian Hardwick,
Scotts Valley, CA*

(Continued on page 12)

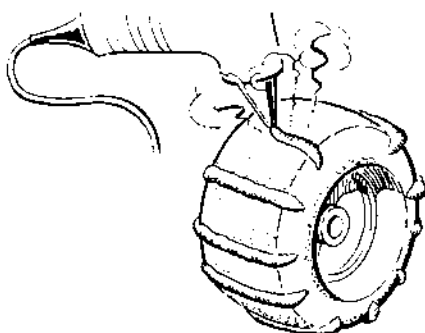
Radio Control Car Action will give a one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Pit Tips." Send a check (sent to Jim Newman) to Radio Control Car Action, 281 Danbury Rd., Walling, CT 06497. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



BODY CLIP STORAGE (I)

Glue a piece of Velcro[®] to one side of a magnet and another piece to your pit tool kit. Put your body clips on the magnet, and fasten it to the kit's Velcro[®] patch so that you can remove it and take it trackside. Or, sew a strip of Velcro[®] to your team jacket's cuff so that you can easily carry the clips with you.

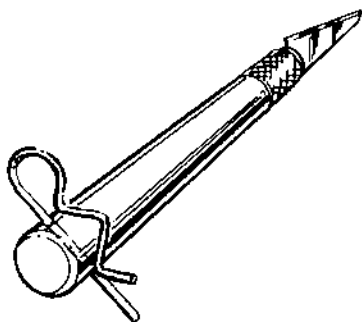
Dan Shindell, Phoenix, AZ



HOT-MELT MUD PADDLES

Renew your off-road tires' worn mud paddles by applying beads of glue with a hot glue gun. To retain the balance, make sure that the beads are evenly spaced and similar in size.

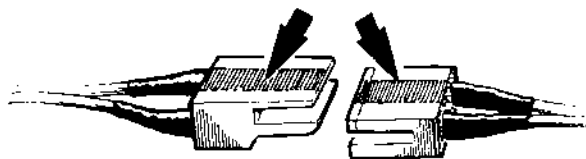
Dixon Pollard, Engle, NF, Canada



NON-ROLLING KNIFE

Drill a hole in the handle of your hobby knife; then insert a body clip in the hole. The clip will prevent the knife from rolling off your workbench and possibly injuring your foot.

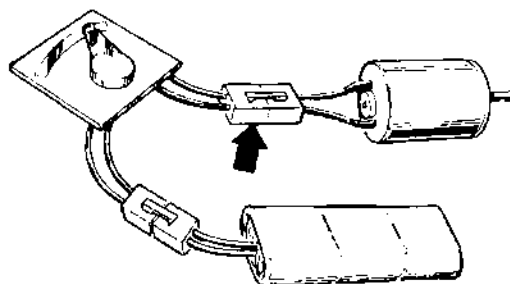
Keith Bishop, Billings, MT



COLOR-CODED PLUGS

Connecting plugs incorrectly will damage electronic speed controllers. To avoid an improper connection, use a permanent marker to draw a stripe along the face of the plug and socket when they're correctly matched. Then, whenever you connect the two, just be sure to match the stripes.

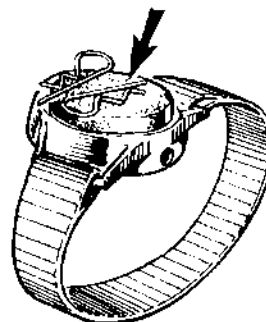
Chuck Sellers, Mobile, AL



QUICK CHANGE MOTORS

If you install a plug and socket in the line between the controller and the motor, you won't have to melt the solder when you change the motor. And, to discharge your pack fully, you'll be able to bypass the controller by connecting the battery directly to the motor.

Thomas Cusley, Clifton Park, NY



BODY CLIP STORAGE (II)

Remove the works from an old watch, and glue a magnet in their place. Then you can park your body clips on your wrist while you work on your car between races.

Patrick Brown



INSIDE SCOOP



by CHRIS CHIANELLI

IN SEARCH OF FUN AND GLORY, 'CAUSE LIFE'S TOO SHORT TO BE A SHEEP!

Trinity/PROCAR

Trinity has introduced the new **Spec Motor**

PROCAR Spec Motor—the approved motor for all PROCAR-sanctioned events. For those who don't know, the purpose of the PROCAR motor is to make Spec-class racing fair for novices. It will also support local hobby dealers, who are vitally important to the well-being of R/C. This certified spec racing motor will ensure that every racer has an equal powerplant, so race events will once again be a test of driving skill—not spending ability!

For those wondering about how these motors will perform in other events, the commutator timing of these motors is locked at 12 degrees, and with 21 turns of 21-gauge wire, they should outperform almost all other stock motors. Trinity's PROCAR Spec Motor is available only through local hobby shops.



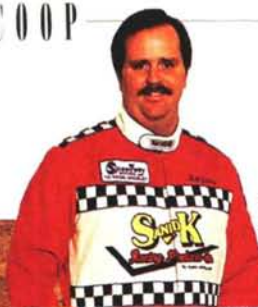
MRC/TRINITY WORLD SCALE RACE Big Race for Big Bucks

Here's a hot flash for owners of MRC's World Scale vehicles, or for anyone who's even thinking about getting into one of these exciting new rides: MRC and Trinity are holding a "Big Race for Big Bucks" race at the Ranch Pit Shop off-road track on September 18-19. Everything about the event is sure to be big: big cars and trucks (the World Scale vehicles have up to 50 percent more mass than 1/10-scale off-road cars and trucks), big money (more than \$6,000 in cash, plus many other prizes) and big-name drivers (Joel Johnson, Rick Hohwart, Derek Furtani and Chris Allec are just a few who are gearing up for this race). Don't miss out on this fast-rising new segment of the R/C hobby. Stay tuned to *Car Action* for more details. As we get 'em, so will you.

\$6,000



S&K-Sponsored Modified



S &K Racing Products—maker of AIRS™ Bodies and Ironman Motors—is proudly sponsoring the IMCA Modified Stock car and its driver, Rob Young, on the race circuit this year. Reports have it that the crowds go wild as the great-looking car power-slides past the competition. Be sure to keep an eye out for S&K's Modified as it travels through the Midwest.



Mu-Juice **M**ugen USA has introduced its new line of premium fuel that's specially formulated to provide high power in .12- to .21-size engines while keeping head temperatures down. Mugen uses only the highest quality methanol—the same grade used by full-scale drag-car race teams. This American-made nitro contains fortified castor oil, so it extends engine life by maintaining lubricity even at high running temperatures. A cleaning additive controls varnish, and it will give Mu-Juice the reputation of being a clean-burning fuel. It's available in blends of 10- and 20-percent nitro. For information contact Mugen USA Ltd., 7021 Veterans Ave., Brooklyn, NY 11234; (718) 251-7660, fax (718) 241-8435.



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- ☐ ROAR 1/12th, On-Road, Modified National Championship - Joel Johnson
- ☐ 4-Cell Modified Winter Nationals Modified Championship - Mike Blackstock
- ☐ U.S. Oval Masters Modified Championship - Mike Blackstock
- ☐ ROAR 1/10th Speedway Modified National Champion - Ernie Bucci

Team

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MAY THE FORCE RACE WITH YOU

Motor master Mike Reedy has added two new stock motors to his race-winning line. The Force I and the Force II have short-stack armature technology and the new 4.9 "M" magnet. This combination produces one very hot stock motor. Force I is a ROAR-legal, 24-degree stock motor with a commutator lock on its armature. Force II is a 38-degree stock motor that's designed for NORRCA rules, and it's used where 24-degree ROAR motors aren't required. Each costs \$28. Contact Associated Electrics Inc., 3585 Cadillac Ave., Costa Mesa, CA 92626; (714) 850-9342; fax (714) 850-1744.



The Ugly Award is Given



In "Team Ugly" in the April '93 edition of "Scoop," I asked who was responsible for this creative R/C adaptation. There were many interesting answers. Some of you even thought this was my work—wrong! It's the work of long-time Team Losi driver Ron Rossetti. The picture was taken in '84 in Costa Mesa, CA, at the Radio Control Hobbies Race Track. Ron has used Styrofoam food containers for off-road bodies, too. A six-month subscription of *Car Action* goes to Blane Hook of Ft. Walton Beach, FL, for correctly answering this trivia question.

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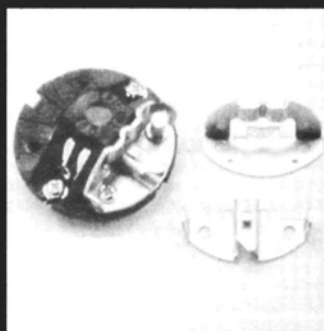


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TRINITY

SLOT MACHINE

by FRANK MASI



To ensure proper alignment, the brush hoods are actually keyed into the endbell's heat sinks. To allow easy removal and replacement, the spring posts are threaded into the endbell.



Vents in the sides and bottom of the endbell's heat sinks allow cooling air to circulate.

LET'S GET REAL for a moment. How much faster can they make stock motors go? When Trinity started doing funky things to its stock-motor armatures—such as removing the center portion of the laminations to reduce rotating mass and to increase cooling—I thought I had seen it all. How far are these guys going to take this thing? After all, it's only stock-class racing, right? Most manufacturers are so busy designing and building their hot modifieds that stock-motor development seems to get tossed into the back seat along with the dirty socks and the empties. (I'm talking about soda cans, you buffoons! Followers of the Ayatollah of Radio Controlla *never* drink and drive.)

Trinity puts the same effort into its stock motors as it puts into its mods; the success of their Slot Machine slotted-armature stock motor and their more recent Green Machine short-stack slotted-armature stocker prove this. These are very quick motors!

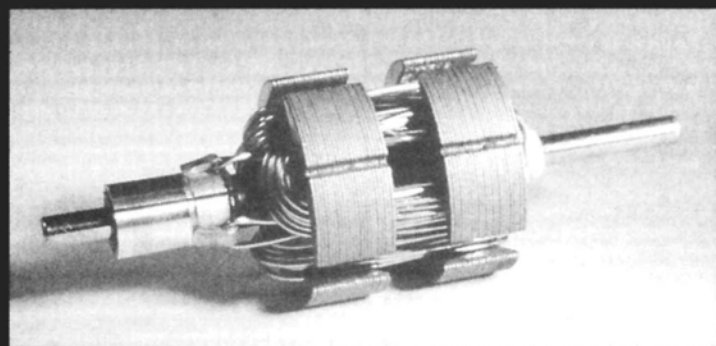
The phrase "tough act to follow" aptly describes the Slot Machine and Green Machine stock motors. What else could be done within the constraints of the current ROAR stock-motor parameters to improve their performance? Nothing, I thought, until I was shown the prototype of the latest incarnation of Trinity's 27-turn terror—the Slot Machine II (hey, so they used up their originality on the motor's design and had none left for the label).

The Slot Machine II actually came about accidentally. When Neal McCurdy and the Trinity motor-design team were working on a new modified motor, they thought that some of their ideas might improve stock-motor performance. They tried these designs, and guess what, boys and girls? They worked!

According to Trinity, the Slot Machine II is the first all-new motor design since the current Yokomo motor, which was introduced back in '82.

In addition, the brush hoods themselves are keyed into the molded endbell to maintain proper hood alignment with the armature—even if you have to remove the brush mounting screws, or remove the hoods entirely to use a stock-motor comm lathe. Small vents channel air under the brush hoods to help keep them cool. Also, the sides of the hoods are vented, as is the molded portion of the endbell.

Trinity will offer several brush configurations—full and



The heart of the Slot Machine II is this 27-turn, short-stack slotted armature. The slots milled into the sides of the armature poles allow air circulation and act as drill-bit guides for the balancing drill.

ENDBELL

The S.M. II's most significant features are found on its endbell. The brush hoods have been laid down to gain more brush wraparound on the comm, which generates more power through increased conductivity. With this brush arrangement, you can use timed brushes, and they'll have as much contact area as full brushes would in a conventional arrangement.

timed, and in a variety of compounds—for their new motor designs. The brush hardware is attached with screws, and a thread-in spring post is included so that all current brush springs will work without modifications.

MOTOR CAN

Even the can on the Slot Machine II is different. To allow cooling air to circulate around the armature, vents have been

PHOTOS BY WALTER SIDAS

II

stamped in between the magnets in the can. Other motors have this design, but the Slot Machine II's vents are different: they aren't just punched out. The material is still attached to the can, but it's bent toward the armature so that it acts as an air scoop to help cool the motor. In addition, the bottom can vents are teardrop-shaped to assist airflow through the can. Of course, the new motor uses Trinity's 5.0mm wet magnets for a super-strong field and long motor life.

ARMATURE

The armature is made of a dual-rotor, short-stack blank—just like the Green Machine—but the new armature has a few interesting changes. A small slot that runs along the length of each pole increases airflow and also serves as a drill-bit-centering device when you balance the armature. With the slot, the balancing drill will always be centered. A redesigned comm lock keys into each armature pole to prevent tampering.

PERFORMANCE

Trinity R&D predicts that the Slot Machine II will develop more power, run cooler and have more versatility than current stock motors because of its laid-down brushes. By running cooler, it will last longer and perform more consistently, which means that it will maintain the same speed throughout a race. The new Slot Machine II is definitely a breakthrough in R/C motor technology!

Here's the address of the company that's featured in this article:
Trinity Products Inc., 1901 E. Linden Ave.
#8, Linden, NJ 07036. ■

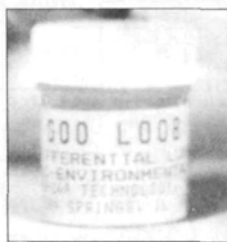


The motor can's sides are vented, and the "punched" material helps to remove warm air from around the armature, keeping it cool and prolonging motor life.

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Peugeot 905 Scale Car Body



Protoform brings this unique body style—one that has been so successful in Group C racing—to on-road racing. The Peugeot light, low-profile body fits all the popular chassis, and its fine detailing makes it a favorite on the track. A separate rear wing is included.

Part no.—1401; price—\$19.95.

Protoform, 537 Niagara St., St. Catharines, Ontario, Canada L2M 3P6; (416) 646-7638.

RABORN

Invencer XT Oval Truck

The Invencer XT is on the cutting edge of "oval" technology. The front and rear A-arms are the same, and the front and rear bulkheads will fit the left or the right of the truck, as will the caster block and hub carrier. Having parts that will fit both front and rear, and left and right reduces the number of spare parts that you need. The front-suspension bulkheads have four caster settings: 10, 15, 20 and 25 degrees, and they can be adjusted quickly, so you can dial-in your car faster. The highlight of the kit is the diff, which is smoother and lighter than any other oval diff. Everything is readily accessible from the rear of the car. The kit includes foam



tires, a body, hard-anodized shock bodies, ball bearings, polished hinge pins and graphite components.

Raborn Racing Originals, 6707 Chimney Rock, Bellaire, TX 77401; (713) 668-8866.

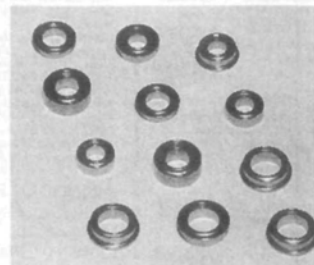
BOCA BEARING CO.

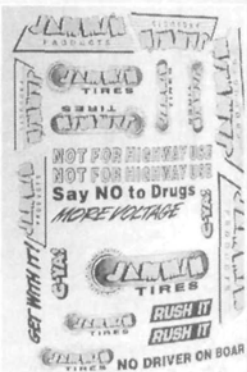
Car & Truck Guide

Boca Bearing's new guide shows more of the popular Ultra-Seal bearings than ever before. Racers choose them because they're friction-free and require no maintenance or additional lubrication. They're now available in many more sizes, too—all listed in Boca's new guide.

Price—\$3

Boca Bearing Co., 7040 W. Palmetto Park Rd., Ste. 2304, Boca Raton, FL 33433; (800) 332-3256 (USA); (800) 553-3256 (Canada).





TEAM LOSI

Jammin' Logo Sticker Sheet

At last, Jammin' Racing offers a complete sheet of logos. It includes the Jammin' logo as well as a Jammin' tire logo and several catchy phrases. The logos are printed in bright neon colors that will enhance any R/C car or truck body.

Part no.—J-801; price—\$3.

Team Losi Inc., 13848 Magnolia Ave., Chino, CA 91710; (909) 465-9400.

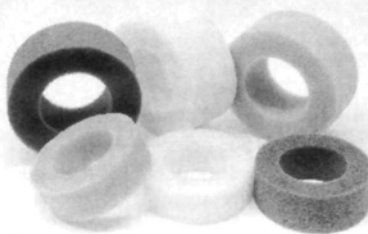
MOTOR MAN

Tire Inserts

To increase traction, put these foam inserts inside your truck and buggy tires. They'll help to prevent your tires from being deformed and losing their bite. They're offered in three compounds—soft, medium and hard—and serious racers never mount their tires without them!

Part no.—MM1800; price—\$4.95.

Motor Man, 8950 Osage Ave., Sacramento, CA 95828; (916) 381-7491.



TEKIN

Universal Connector Set

Tekin Electronics offers interchangeable housings that can be adapted to most radio systems, and they're made on a new mold, so they now fit better and are more reliable. Each set contains two Futaba/Tekin/Kyosho/JR plastic housings, one Airtronics/Sanwa housing, one KO housing, and one 8-inch three-connector ribbon cable with JST terminals on one end.

Part no.—UNV005; price—\$6.

Tekin Electronics, 940 Calle Negocio, Ste.

140, San Clemente, CA 92673; (714) 498-9518.

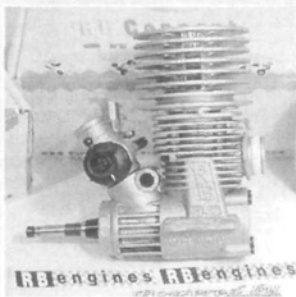


SIGMA TRADING CO.

RB Concept Motors

Sigma Trading Co. is the only U.S. importer and distributor of the new line of high-performance 3.5cc engines designed by former 1/8-scale world champion Rody Roem. Made in Italy by Nova Rossi, the engines have already proven themselves in European competition. There are four distinctly different versions: Economy, Buggy, Circuit and Full-Race Circuit (which has extensive internal modifications by Rody). Unique to this line are thicker piston sleeves and a larger crankshaft (big end); they increase the engine's strength and smoothness.

Sigma Trading Co. Inc., P.O. Box 51589, New Berlin, WI 53151; (414) 789-1288.



TRINITY

Motor Break-In

I've cut the comm and changed the brushes in my motor. Now what?

Break the motor in, that's what! But how? Racers have more ways to break-in brushes than they have reasons why they didn't win.

Every motor builder has his own pet method of conditioning his motors before they are run, and he may use different methods for different types of racing. I use basically the same type of break-in procedure on all types of motors. I start by putting a drop or two of brush lube, such as Trinity's Revtech Brush and Comm Drops, to reduce the chances of comm damage during startup and to improve break-in. I then run the motor at 5 volts for 20 to 30 seconds for oval racing, and for 2 to 3 minutes for roadcourse or off-road racing. When I have finished, I add a few more drops for the magic winning edge.

Break-in time varies with the hardness of the brushes. Soft brushes will seat quickly and be easy on the comm, but will not yield as much power as hard brushes, such as Trinity's AG9 and 4038 hard compounds. The hard brushes, however, require more attention to detail when you use them. Be sure the comm and springs are good, and that the brush shunts will not hang up on the hoods. Take the time to do it right!

Gone are the early days of R/C when we used to water-dip the closed endbell Mabuchi and Igarashi motors because their brushes were so hard. We've come so far; thank God that practice is all but gone.

RC-4040
Brush and Comm
Drops

RC-4455
AG9 Silver Hard
Brush

RC-4038
Hard Double Shunt
Brush

Until next month,
Neal McCurdy
Trinity Team Manager

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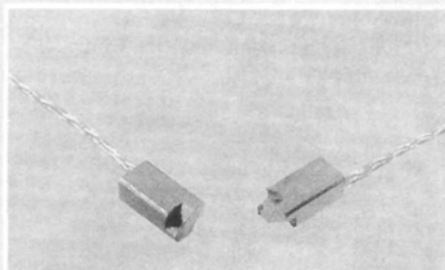
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WHAT'S NEW

BUD'S RACING PRODUCTS

HPS Diamond Cut Motor Brush

The innovator of the popular hollow brush, Bud's now brings you the diamond-cut brush, which is ideal for faster, more powerful stock motors. The unique cut of the



brushes allows full contact with the commutator and reduces contact drag.

Part no.—7154; price—\$4.

Bud's Racing Products, 1575 Lowell St., Dept. RCCA, Elyria, OH 44035; (216) 284-0270.

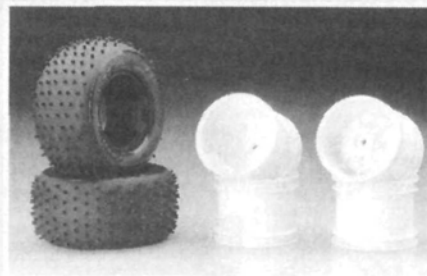
KYOSHO

Racing Truck Tires

Used on Kyosho's Outlaw Ultima electric and Outlaw Rampage nitro-powered racing trucks, these low-profile racing tires have been shown to give an advantage in competition. Sold in pairs, they have a spiked tread that's perfect for hard dirt tracks; they really dig in for great speed and acceleration.

Part no.—KYOC6219; price—\$10.95/pair.

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-3630.



KYOSHO

Special Antenna Holder

Make just one hole and then mount this unique aluminum antenna holder on the chassis or radio tray of any racing vehicle. It holds the antenna securely during races, but allows it to be removed easily for transportation.

Part no.—KYOC2051; price—\$8.50.



Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-3630.

INSIDE LINE

Aluminum Link Plate Support

Designed for the Lynx II, the Inside Line aluminum link-plate support will totally eliminate flexing in this area. It will also allow you to adjust your car's wheelbase without having to completely disassemble the rear end. The steel pivot-arm pin has been replaced by a quick-change pin, and the unit weighs the same as the stock plastic A-arm/link-plate support and steel pin.

Part no.—3802

The Inside Line, 12859 Rte. 108, Highland, MD 20777; (301) 854-2701.



TALON PRODUCTS

Fastener Kits

Talon Products offers more than 300 of the best, most popular, standard and metric socket-head capscrews, socket setscrews, nylon insert lock-nuts and washers in a durable plastic case. Keep them on your workbench and use them to upgrade, maintain, or

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Talon Products, P.O. Box 91, Crystal Lake, IL 60039; (800) 455-7204.



PARAGON

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Liquid Bearings goes on wet, sticks and dries in seconds, and it *won't attract dust!* It actually impregnates parts so that they run more smoothly than ever before. Use it on gears, ball joints, differentials—anywhere there's friction.

Part no.—LB025; price—\$3.95.

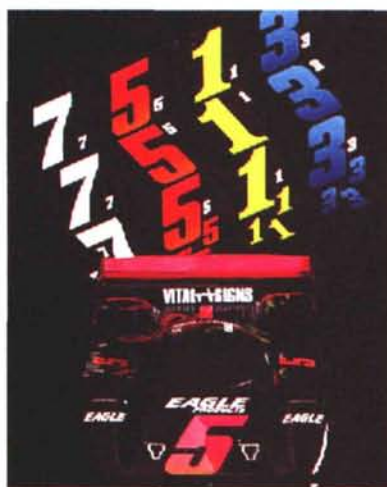
Paragon Racing Products, 690 Industrial Cir. S, Shakopee MN 55379; (612) 496-0091.



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Car Action
TRACK REPORT



Kyosho

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PHOTOS BY MATT HOLBO

Renault
FW18C!

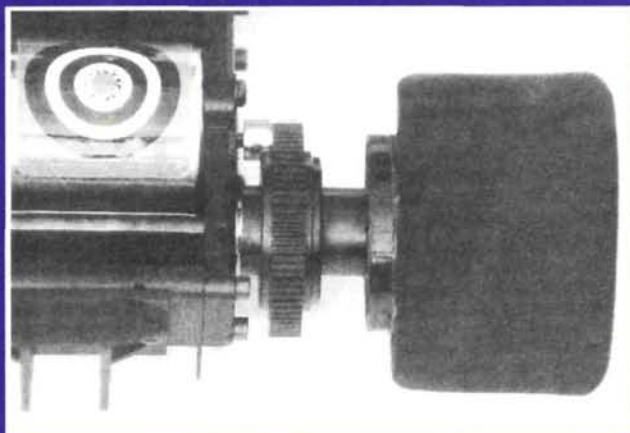
Formula for Fun

by BILL MOSS

FORMULA 1 HAS been around for many years, and it's one of Europe's most exciting and popular forms of racing. This circuit has drawn racers from all over the world to test their mettle on the most challenging race tracks. It's incredible to see these aerodynamic speed demons streak down the tarmac at speeds well over 200mph. With their shapely open-wheel bodies, complex suspension systems and multi-stage rear wings, these cars perform well and look awesome, too!

During my years of involvement in R/C, I've heard a lot about Kyosho*; its line of cars and trucks has been a leader in entry-level and high-performance racing. But, until now, I had never built or driven anything from this successful, Japan-based company. Well, as you might have guessed, I jumped at the chance when the Ayatollah of Radio Controlla asked me (more like commanded me!) to review Kyosho's 1/10-scale electric version of the Williams-Renault FW-14 car driven by Nigel Mansell.

As soon as I saw the UPS man at the door, I snatched the large box from his hands and quickly signed on the dotted line. I slammed the door (I hope I didn't get his fingers!) and immediately began to tear through the packing



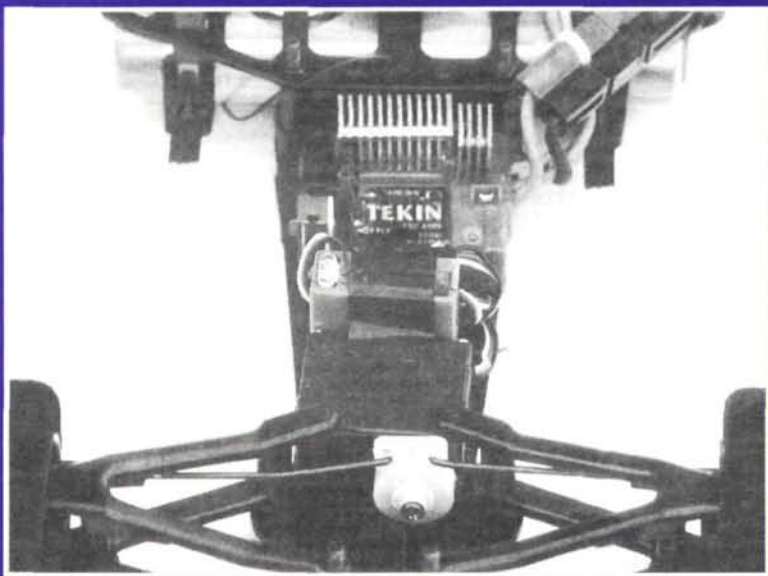
The motor's power reaches the wheels through a reliable gear diff. The 48-pitch pinion gear is a nice touch.

tape. Soon, I was greeted with a colorful box bearing the Kyosho name. After I scrutinized all the color photos on the outside of the box, I lifted the top off and examined what was inside.

The FW-14 is an entry-level kit from Kyosho's new line of affordable Formula 1 cars that offers scale realism with a conventional on-road suspension design. Its features include a strong double-deck chassis, scale front-suspension arms with a floating kingpin, a pod-type rear suspension, scale rims with foam tires, and a highly detailed polycarbonate body and multi-stage rear wing.

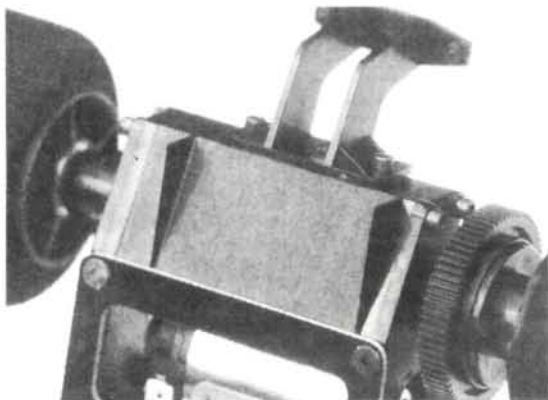
FORMULA FOR CONSTRUCTION

The kit is laid out in the familiar Kyosho way: numbered poly bags contain parts on those oh-so-familiar parts trees. As always, make sure that all flashing is removed from the parts before you assemble them. Most of the parts, e.g., the rear-pod pieces, the upper chassis plate and the gear-diff components, are made of strong, fiberglass-impregnated Kelron plastic; the rest are made of a stronger-than-usual ABS plastic.



Even though space for the radio gear looks limited, everything fits well. A small Kimbrough servo-saver was substituted for the stock one.

WILLIAMS-RENAULT FW-14



The bottom of the rear bulkhead is angled to improve aerodynamics, and two molded fins channel the air out from under the chassis.

Kyosho has always been known for its accurate instruction manuals with excellent illustrations and full-size diagrams of all screws and nuts. Although the manual for the Williams kit isn't an exception, I had a few problems with the grammar in the translation from Japanese to English, e.g., "Tight securely the nut."?! The corresponding illustrations cleared up any misconceptions, however.

The first step in assembly is to secure the foam tires to the rims; this is done with thin strips of double-sided tape, and it's a tedious process. Wrap one strip of tape around each end of a rim, then pull a small piece of the backing off and bend it over to use as a tag. After that, wrestle the tire onto the rim, slowly pull the tag to remove the rest of the backing, and voila! Although I'm skeptical about using this method for an entry-level car (it might discourage some beginners), I suppose that mounted tires would raise the kit's price.

Next, assemble the battery deck and secure it to the chassis. I'm fond of this setup; it accepts standard stick-type battery packs and holds them across the chassis (from side to side) with adjustable black straps. The deck is mounted on the chassis with two black plastic standoffs that serve as mounts for the T-plate. This system also allows you to secure stick packs within a center of gravity that's similar to that of saddle packs, and this allows better weight distribution. The black plastic deck also serves as a mount for the rear body mounts and the damper post.

The double-deck chassis is made of Kelron and ABS plastic, and it's connected to the front end with long steel screws and aluminum nuts. The chassis would be much too weak if not for the upper deck; and, with the car assembled, the upper deck seems to improve the vehicle's aerodynamics.

The manual also includes sections about assembling the front and rear suspensions and the gear diff; installing the radio gear; and painting and detailing the body and the rear wing.

FRONT SUSPENSION

Assembly of the front suspension starts with the two-piece, scale A-arms, which are copies of the full-size, Formula 1 equipment. Suspension movement is handled by a conventional floating kingpin system. To assemble it, insert the kingpins into the tough steering arms, and secure them with E-clips. The supplied coil springs are reminiscent of the type used on Associated on-road cars, and though they might be too stiff for roadcourse racing, they'll probably work well on the oval circuit. Also, to aid damping, I coated the kingpins with thick silicone lube.

The steering setup is simple. A direct connection (no bellcranks) uses steering

KYOSHO WILLIAMS-RENAULT FW-14



Type Formula 1 entry-level on-road
Sug. retail price \$139.95

DIMENSIONS:

Overall length 15 in.
Width 7.875 in.
Wheelbase 9.8125 in.
Front track 6.75 in.
Rear track 6.3125 in.

WEIGHT:

Gross (with battery) 2 lb., 4 oz.

BODY:

Type Williams/Renault FW-14
Material Polycarbonate

CHASSIS:

Type Double-deck pan
Material Kelron/ABS

DRIVE TRAIN:

Primary Pinion/spur
Transmission Direct-drive
Differential Gear
Bearings/bushings Metal and plastic bushings

SUSPENSION:

Type (front) Floating kingpin
Damping (front) Coil springs
Type (rear) Friction disks/flexing T-plate
Damping (rear) Coil springs

WHEELS:

Type (front) Scale one-piece plastic
Dimensions (DxW) 1.4375x1.125 in.
Type (rear) Scale one-piece plastic
Dimensions (DxW) 1.4375x1.5625 in.

TIRES:

Front and rear Green-compound foam

ELECTRICS:

Motor Le Mans 05 stock
Battery Not included
Speed controller Not included

OPTIONS AS TESTED:

KO Propo EX-II radio, Futaba S132H servo, Tekin 410S ESC, Novak NER-2X receiver, Point Blank 15-turn Outlaw stock motor and P-170 SCR 6-cell stick battery pack, Kimbrough servo-saver.

HITS: • Low price • Easy to build • Easy to maintain • Scale detail

MISSSES: • Gear diff • Lacks high-tech suspension

rods with a Z-bend on one end and a ball link on the other. The Z-bends are then connected to a servo-saver. Unfortunately, I had trouble fitting the steering rods to the servo-saver, so I replaced the servo-saver with a small Kimbrough* unit. Although this system looks weak, it works just fine.

REAR SUSPENSION

The base of the rear suspension is a one-piece, black, fiberglass T-bar/lower-pod plate that's anchored to the lower part of the battery-deck standoffs by two countersunk screws. (For smooth movement, the rear screw is secured with a black rubber O-ring.) Attached to the pod end of this T-plate are an adjustable motor mount/right-axle carrier, a left-axle carrier, a ground-effects/wing-mount rear bulkhead and a front friction plate. All are molded of Kelron, which, unfortunately, doesn't dissipate heat, so I added a Trinity* purple-anodized aluminum heat sink. If you want to upgrade to more high-tech equipment, a machined-aluminum motor mount is available from Kyosho.

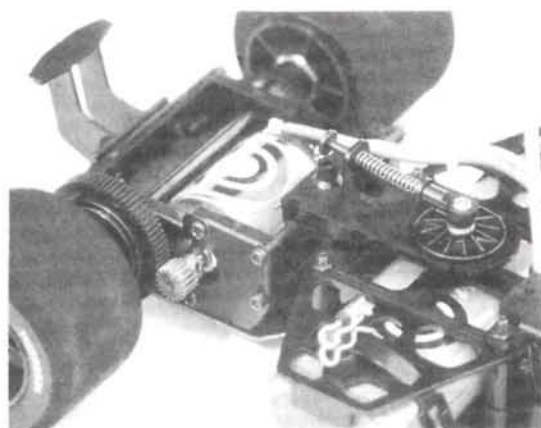
The friction-damper system is similar to the system used on Associated cars. First, put a coil spring on the damper post, followed by a damper disk that's coated with lube, the friction plate, another coated damper disk and another spring; and then secure the assembly with a ball-stud.

The only part of the rear suspension I don't like is the friction "shock" that's used for lateral movement; basically, it's a shaft, a spring, and a ball-end snapped to the ball-stud; and it offers almost no damping. But, again, it was probably used to keep kit costs down. (Kyosho offers an aluminum-bodied, oil-filled shock that will improve performance.) To slow the suspension action, I coated the shaft with the supplied silicone lube.

DEFINING THE DRIVE LINE

Although ball diffs are the norm for most on-road cars, e.g., the 10L, the Lynx II and the Evolution 10, Kyosho supplied a 48-pitch gear diff. At first, I frowned at this, but after careful consideration, I understood Kyosho's design logic:

1. Gear diffs are cheaper to make, so this reduces costs.
2. This is an entry-level car, so beginners will find the gear diff easier to assemble and less expensive to maintain.
3. The setting of a ball diff is critical to performance, so a newcomer might become frustrated and start throwing things wildly. (I'm speaking from personal experience, of course!)



The rear suspension consists of a Kelron/fiberglass motor pod with a friction plate and damper disks that control side-to-side movement. The spring and shaft "shock" doesn't provide much damping, though.

One interesting characteristic of this diff is that it's 48-pitch; most entry-level cars have 32-pitch gear diffs. It's also one of the smoothest gear diffs I've ever used, and this improves cornering on tight roadcourses. The unit comprises a 67-tooth spur gear filled with four spider-type gears, and two large bevel gears coated with silicone diff lube, which gives the diff its smooth action. All the components are made of durable Kelron.

To put this diff to work, Kyosho uses an anodized steel axle that's supported by metal bushings (which I will replace eventually with sealed ball bearings). On each end of the axle are two awesomely machined works of art: billet-aluminum axle tips that you can polish to a gleaming finish. I was surprised to see such cool hardware in a kit that will cost about \$100 in hobby shops! (Thanks, Kyosho, you're on the ball!)

After you've completed the diff and axle assemblies, attach the rear tires, and, using the supplied four-sided box wrench, secure them with plastic bushings and aluminum locknuts.

Don't forget to lubricate all the metal and plastic bushings; this will keep the Williams running smoothly and will also extend its life.

I was surprised to see such cool hardware in a kit that will cost about \$100 in hobby shops!

MANSSELL MOTIVATION

To give this car its "electric" personality, I started with a KO Propo* EX-II transmitter, which has done its job quite nicely throughout its 3-year existence. Receiving the "waves" is a lightweight Novak* NER-2X 27 MHz mini-receiver. For maximum motor control, I turn to a Tekin* 410S electronic speed controller. And finally, a Futaba* S132H ball-bearing mini servo handles the steering commands. The chassis area between the front suspension and the battery deck is reserved for mounting the electronics, and although it looks cramped in there, I had no problem with space.

I wanted to test this vehicle with the supplied Le Mans 05/540 motor (referred to as the "beer-can" by veteran motor jockeys), and also with a hot wind for gear-ripping punch and ballistic speed. My choice was a new motor from a relatively new company called Point

The Real Thing

In the 1991 Formula 1 Grand Prix circuit, the Williams FW-14, with its aerodynamic shape and powerful Renault V10 engine, performed excellently. Problems experienced early in the season with the new electromagnetic, semi-automatic transmission were overcome by the time of the Monaco Grand Prix, and the Williams went on to dominate seven of the 16 races in the circuit; Nigel Mansell won five and Ricardo Patrese won two.



TRINITY® Evolution 10

MAGIC TRICKS Shock oil

by Joel Magic Johnson®
current IFMAR 1/10-Scale World
Champion



This month, let's talk about shock oil. You know, that slippery stuff that comes in that little bottle that usually loses its top in the bottom of your toolbox, covering everything with a nice film of 30 weight. Shock oil is one of the most overlooked items in setup. It is added to the shocks almost as an afterthought, instead of as a way to

really dial in your car. It is important to have not only the right weight of oil in your shock, but the right kind.

That's where Trinity's "Pro Racer Silicone Shock Oil" comes into play. When we were testing our EV10 before the IFMAR World Championships, we were very dissatisfied with the oils on the market. Most were not true to their weights, were different each time we bought a bottle and changed drastically according to the temperature. They also broke down as soon as we actually used them in a shock.

RC7610	10-weight silicone oil	\$2.99
RC7615	15-weight silicone oil	\$2.99
RC7620	20-weight silicone oil	\$2.99
RC7625	25-weight silicone oil	\$2.99
RC7630	30-weight silicone oil	\$2.99
RC7635	35-weight silicone oil	\$2.99
RC7640	40-weight silicone oil	\$2.99
RC7645	45-weight silicone oil	\$2.99
RC7650	50-weight silicone oil	\$2.99
RC7655	55-weight silicone oil	\$2.99
RC7660	60-weight silicone oil	\$2.99
RC7670	70-weight silicone oil	\$2.99

We knew we could do better, and we feel that we have. The new Trinity "Pro Racer Silicone Shock Oil" is the best that I have ever used, either for on-road or off-road racing. The shock weights are right on the money and are not affected by either heat or use. You can put our oil in your shock and the weight will stay the same all day, regardless of the temperature. This is great for those of you who race at night, when it starts to get really cool just as the A-Mains are taking place.

So think about what oil you're using in your shocks. We have solved the problem of inconsistent and nonlinear weights, weight instability due to temperature changes, and usage breakdown, but we still can't keep it from spilling in your toolbox!

Until next time,
Joel Magic Johnson®

ADVERTISEMENT

WILLIAMS-RENAULT FW-14



Point Blank

A new company has sprung up on the East Coast; its products are distributed by Trinity, and it's headed up by none other than world champion Tony Neisinger. Point Blank has an excellent attitude about the R/C business: they sell high-quality products at prices that everyone can afford. Their product line includes Dirt Assassin motor-cleaning spray, genuine rubber off-road racing tires, hot outlaw stock motors and rare-earth magnet modifieds.

Expect to see more great products from this company as time goes by; we'll keep you updated!

Blank* (see sidebar). I used an awesome, 15-turn-single Outlaw stock motor and a 6-cell set of their P-170 SCR batteries in stick formation. At first, I thought that this combination might do some damage, but then I remembered that the Renault is a direct-drive vehicle. (Anyway, what's wrong with livin' on the edge?!)

LEXAN SO LIVELY!

Scale: what does the word mean? Well, in the R/C car world, it means a vehicle that's as close as possible to the full-size version in appearance and performance. Unfortunately, most of our R/C rides don't fit the criteria for scale appearance without sacrificing performance; the wide tires of off-road trucks, such as those used on the LX-T and RC10T aren't even close to the scale size used on full-size stadium racers. What they lack in scale appearance, however, they make up for in traction and cornering.

Thankfully, Kyosho has spared no expense to give this kit one of the most awesomely detailed bodies that I've ever seen. From the nose to the rear wing, this vehicle looks incredibly scale, especially when you drive it! The kit's huge decal sheet allows you to choose either Nigel Mansell's or Ricardo Patrese's scheme (each driver has different helmet decals and body numbers). There are also five other Formula 1 bodies that will fit the same chassis, so you can go from the Williams FW-14 to the Ferrari F189—excellent!

But all this scale detail doesn't come without a lot of tedious work. The body is

a three-color job with tons of decals and the like. So, I turned the painting duties over to the Paintmaster—my brother-in-law Jeff Fellman. As you can see from the photos, he came up with another beauty.

A Formula 1 car wouldn't be right without wings! The single-stage, front stabilizer wing is made of strong Kelron plastic and should stand up to many beatings. The rear wing is a double-stage polycarbonate affair that's bolted together with small plastic beams and is attached to the rear of the motor pod with a 90-degree mount.

With the car fully assembled, it's one dynamite-lookin' machine—right down to the scale, five-spoke rims!

HITTING THE ASPHALT

Testing took place at the parking lot of my favorite hobby store—and second place of employment—Hobby Shack! The surface was a little dusty and dirty, but after a few quick swipes with the broom, it was up to par. With the Le Mans 05 motor firmly bolted into place and the P170's charged up, I set the Williams down and began to take a couple of slow passes to set trims and get a feel for the handling. After I was comfortable with the car, I squeezed the trigger all the way back and noticed that the speed was brisk and controllable, but not enough to satisfy me.

So, I recharged the battery pack, took out the Le Mans 05, and installed the Point Blank Outlaw stock motor. (Yes,

(Continued on page 87)

Radio Control
CAR ACTION

Truck of the Year

Team Losi LX-T

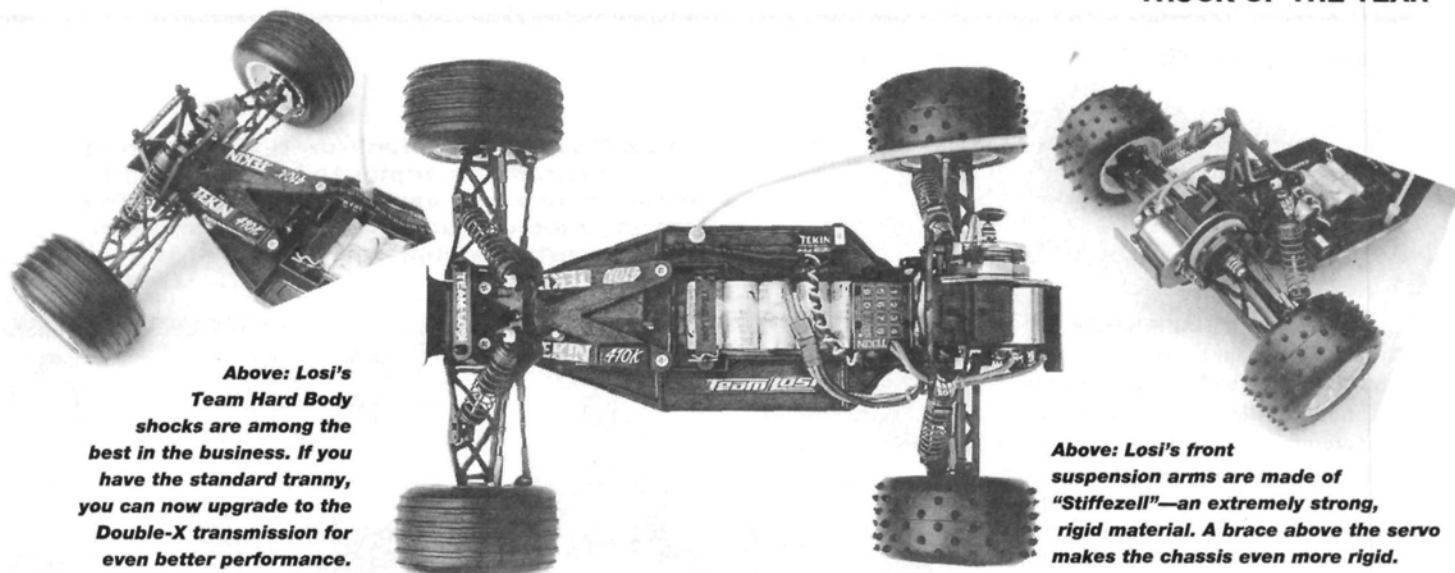
ELECTION SEASON WAS upon us once again; this time, however, change was in the air. The candidates were fearsome, and the margins were narrow, but in the end, only one could emerge victorious. The ballots were cast in their usual orderly fashion (from all directions), and the result was a change indeed.

It came as no surprise to the folks at Team Losi when they heard that their LX-T had won *Car Action's* "Truck of the Year" award. That's because Team Losi's winning track record and its commitment to quality ensure that every LX-T kit that leaves the factory is capable of taking its owner to the winners' circle.



**Gun
rack
optional**

GEORGE GONZALEZ



Above: Losi's Team Hard Body shocks are among the best in the business. If you have the standard tranny, you can now upgrade to the Double-X transmission for even better performance.

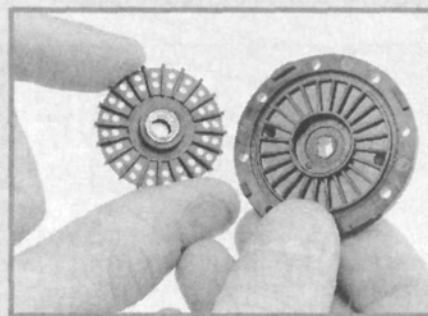
Above: Losi's front suspension arms are made of "Stiffezell"—an extremely strong, rigid material. A brace above the servo makes the chassis even more rigid.

The LX-T is one of the most technically advanced racing trucks on the market today. The suspension and chassis components use state-of-the-art materials and have been designed with a computer-assisted, finite-element stress analysis. The stress analysis uses a program that shows a part's weak areas and how much force it would take to break the part. You can use this program to choose and analyze the material you want.

The Hydra-Drive Difference

The LX-T's LRM tranny is one of the few components carried over from Losi's original JR-XT truck, but it comes with the latest refinements from the Pro-SE racing buggy, e.g., beveled, lubricant-impregnated, 48-pitch gears and a thrust-bearing-supported slipper clutch.

The tranny works with Losi's Hydra Drive slipper unit, which makes the LX-T much easier to drive on very slippery and very bumpy tracks. The Hydra Drive is basically a viscous coupling; inserted between the spur gear and the tranny's output shaft, the unit allows the transmission's friction slipper to be set much more loose-



ly, resulting in more stable handling and better traction.

Team Losi now offers three viscosities of Hydra Drive fluid. Light is used mainly for buggies; medium is the original viscosity (used in buggies on high-traction tracks, or in trucks on low-traction tracks), and heavy fluid is used mainly for trucks. Using different fluids enables you to alter the way in which the unit operates.



Check out this exploded view of the Hydra Drive on the Silicon Graphics computer.

PLASTIC CHASSIS?

The LX-T and the JRX-Pro SE use the same molded-plastic composite chassis; it's extremely rigid and lightweight. It took Team Losi years to come up with an inexpensive, molded chassis that's just as rigid—

or even more rigid and consistent—than the more popular graphite and aluminum units. It was pretty sneaky of the folks at Team Losi to use this high-tech chassis in an entry-level car (this chassis was introduced in Team Losi's entry-level Junior T and Junior 2), but at the same time, it was a subtle way to reprogram the "graphite is better," or "the pros use aluminum" mentality.

There are some advantages to using the

The LX-T's suspension consists of four extra-long arms with inboard pivot points, and four oil-filled, coil-over shocks.

LX-T's plastic composite chassis. First, the LX-T's molded chassis (with the upper brace attached) is stiffer than a graphite plate and it won't tweak under extreme conditions; second, the molded mater-

ial is not as conductive as graphite and aluminum, and this ensures glitch-free radio operation and prevents electrical shorts; third, the molded chassis is less expensive to produce than chassis made of other materials.

TRUCK OF THE YEAR



The LX-T uses a bellcrank/drag-link steering mechanism that's supported by aluminum posts. There's no need to upgrade here. The steering mechanism is smooth and precise, and it virtually eliminates bump steer.

KILLER SUSPENSION

The LX-T's suspension consists of four extra-long arms with inboard pivot points, and four oil-filled, coil-over shocks. The arms are made of a material that Losi calls "Stiffezell," and they look beefy enough to withstand virtually any collision. Up front, the arms are attached to a narrow bulkhead with hinge pins, and they're kicked up 30 degrees. The rear H-arms are mounted between the rear pivot support and the rear bulkhead with hinge pins. Rear toe-in and anti-squat are provided by the rear pivot

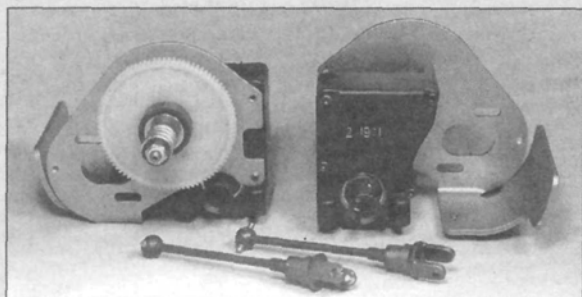


The Team Losi gang. From left to right: Ron Rossetti, Jack Johnson, Jon Anderson, "Pops" Losi, Gil Losi Jr., Gary Kyes, Kyle Reed, Bryan Peterson and Jay Halsey.

DOUBLE-X TRANSMISSION

The engineers at Team Losi have been working overtime to release the next generation of racing transmissions. The new Double-X tranny incorporates a low-friction, three-

Double-X tranny with a 2.19:1 ratio for the Pro SE buggy); it allows the truck to accelerate much more quickly and yields longer run times; it allows the use of taller



gear design with the diff at the tranny's lowermost point. In addition, the Double-X contains fewer moving parts, and it has a lower rotating mass than Team Losi's original LRM gearbox.

The new tranny has a far lower final gear ratio (2.61:1 as opposed to the current 2.18:1 gear ratio; Losi also offers the

pinion gears (this is a great benefit when you use hot wind motors); and it allows the Hydra Drive to operate more efficiently.

Unfortunately, the new tranny wasn't available for testing when I wrote this article, but I had a chance to inspect one up close, and let me tell you, it's one hot box!

support. (Losi offers a set of preset rear pivot supports—part no. A-2016—that allows different combinations of toe-in and anti-squat.)

To provide front toe-in/out and front and rear camber adjustment, a set of adjustable turnbuckle tie-rods are standard. Losi's Hard Body shocks with double O-ring cartridges and Teflon pistons are also standard, as are a set of thick fiber-glass shock towers with a multitude of shock- and camber-rod-mounting holes.

The LX-T uses a bellcrank/drag-link steering mechanism that's supported by aluminum posts. There's no need to upgrade here. The steering mechanism is smooth and precise, and it virtually eliminates bump steer.

WHEELS OF FIRE

The LX-T's wheels are a perfect blend of form and function: the wheels have smooth inner dishes and smooth, Lexan, outer dirt shields that prevent dirt from accumulating inside the wheels (dirt can add weight and throw the wheels off balance). The Lexan dirt shields can also be painted to match the body trim.

The wheels are offset inward, and this allows the front steering blocks and the rear axle carriers to be mounted deep inside the wheel. This greatly reduces wheel scrub under hard cornering. The kit's four-row, ribbed front tires are the most popular on the racing scene, and they work extremely well on almost any track surface. The rear six-row spikes are good for very loose, fluffy



The LX-T designers. From left to right: Clarence Smith, "Pops" Losi, Gil Losi Jr. and Vance Strader.

track surfaces; however, racers will be quick to replace them if they drive mainly on harder-packed, more slippery surfaces (as I do). I chose Losi's step-pin tires for the rear (part no. A-7636), and I have yet to find a track that these babies won't bite on.

PROPER DOCUMENTATION

The LX-T's excellent instruction booklet is very comprehensive, and it's written so that it will be appreciated by both experts and beginners. It's filled with excellent illustrations and exploded-view diagrams that guide you through assembly. In fact, the illustrations are so good that I was tempted to build the LX-T without reading the text (something I strongly suggest you *don't* do). The booklet also includes a step-by-step hardware identification chart, and the parts come in numbered bags that correspond to each step.



The proud parents with their trophy.

The booklet also includes "Tech Tips from the Team." This informative page is filled with tips on toe-in/out, caster and camber, adjusting the diff and the slipper, front and rear ride height and shock mounting. This information is crucial for beginners, and it's a great reference for experts.

I've been racing my LX-T for many months now, and let me tell you, I'm one satisfied customer. The LX-T is a true racing truck that doesn't require any after-market parts to perform well. A little experimentation with shock fluids and springs, and tires and gear ratios is all that's required to win with the LX-T. In the hands of Team Losi drivers Kyle Reed and Jack Johnson, the

TEAM LOSI LX-T

Type Off-road racing truck
Scale 1/10
Sug. retail price \$329.95

Dimensions:

Overall length 16 in.
Width 12 in.
Wheelbase 11.5 in.
Front track 10.25 in.
Rear track 10 in.

Weight:

Gross (with battery) 4 lb., 1.2 oz.

Body:

Type Stadium truck
Material Polycarbonate

Chassis:

Type Molded with upper brace
Material Matrix-fiber resin

Drive Train:

Type Sealed gearbox
Primary Pinion/spur



Differential Ball
Bearings/bushings Bearings

Suspension:

Type (f/r) Lower A-arm/upper link
Damping (f/r) Oil-filled, coil-over shocks

Wheels:

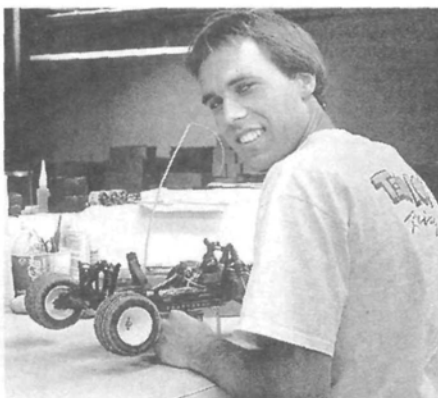
Type (f/r) One-piece w/plastic shield
Dimensions (DxW) (f/r) 2.2x2 in.

Tires:

Front Ribbed
Rear 6-row spikes

Electronics:

Motor Not included
Battery Not included
Speed controller Not included



Here, Jon Anderson readies his LX-T for the upcoming Pro-Line Cactus Classic race (which he won!).

LX-T swept almost every ROAR and NORCA championship in '91 and '92.

The Hydra Drive unit, although optional, is a prime example of how sophisticated R/C has become. (Losi's Double-X transmission, again optional, is another such example.) The Team Losi LX-T is designed to do one thing, and one thing only: kick butt in the dirt. Sometimes there's truth in politics, and the LX-T is one candidate that lives up to its promises.

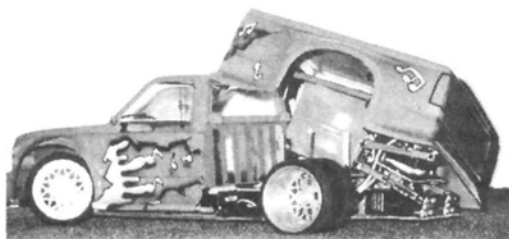
*Here's the address of the company that's featured in this article:
Team Losi, 13848 Magnolia Ave., Chino, CA 91710;
(714) 465-9728. ■

READERS' RIDES

"Readers' Rides" is our way of recognizing the unique, innovative—and sometimes bizarre!—vehicles that our readers have created. Send us a sharp, uncluttered, well-exposed color photo of your car or truck (no Polaroids, please!), along with a brief description, to Readers' Rides, R/C Car Action, 251 Danbury Rd., Wilton, CT 06897. If the Ayatollah of Radio Controlla chooses your photo, you'll receive a 6-month subscription to Car Action, or an extension of your existing subscription. You'll also be eligible for the fourth annual "Reader's Ride of the Year Contest" in the fall of 1993. Write your address and phone number on your letter and on the back of each photo you send, in case we need to contact you.

BACK OFF MAN!

This totally rad Readers' Ride comes from Tim Donley in Long Beach, CA. Tim's LX-T is equipped with the all-new Double-X tranny. A Kimbrough spur gear, a Losi Hydra Drive, a Trinity Sapphire motor and a matched 1700 SCR 6-cell pack round out the drive train. Tim controls the truck with a Futaba Magnum radio and a Novak 410 M1C speed controller.



LOW RIDER

This laid-back California low rider belongs to Harold Fijman of Fremont, CA. The RC10L frame is topped-off with a custom-painted Parma Sport truck body. The hydraulics for the bed consist of brass squares and lots of solder. It's run by a 4-channel Futaba Attack radio with four mini servos, and it's powered by a Twister Pocket Rocket motor and a Novak 410 M5 ESC.



GRADE-A MACHINE

Greg Stout of Dayton, OH, modified his hi-zoot LX-T with a Dahm's Commando XI body, a Novak 410 HPc ESC, a Futaba Magnum Jr. radio and a Team Losi Super Insane motor. Greg usually races weekly—but only if his grades are good.



ON THE GAS

Peter Schiavone of Pleasantville, NY, sent us this photo of his A-Main Racing/Dudgeon Racing RC10T gas conversion truck. The truck is powered by a .12 O.S. CZ-R engine that's equipped with a Kyosho tuned pipe and a DuraTrax heat sink. Other mods include Lunsford titanium rods, MIP CVD joints, A&L ball-bearing steering and RPM's bulkhead and front and rear arms. It looks pretty trick, Peter. Maybe we'll see you at the next gas race!



IT'S A MONSTER!

This beefed-up Kyosho USA-1 comes from Jim Turban of Lemoyne, PA. The truck rides on 12 DuraTrax 4-inch gold shocks with Associated red springs. The power supply for this monster is a custom-made 7-"D"-cell, 4000mAh hump battery. Run times range from 30 to 45 minutes.

Mike Swauger's



Picco Genesis

ONE-EIGHTH-SCALE on-road is probably the world's most realistic, sophisticated and competitive R/C motor sport. If the smell of burning nitro doesn't hook you, the unbelievable power and speed will! That's why, when a single car dominates a major event such as the ROAR National Championships—especially when it's the largest event of its kind ever held—it's bound to make news.

Throughout the Nats, Ralph Burch Jr.

was clearly the favorite to win, but it was his teammate who took the checkered flag. Mike Swauger's victory in Albuquerque, NM, capped off a very successful year both for him and for the Associated/Paris/Picco team. Paris Racing* has been a force in 1/8 scale for many years, but the competition—especially from BMT and Serpent—is now intense! One thing is certain however: Mike Swauger and the Picco* Genesis are here to stay.

Inside the ROAR Nats Winner

by JEFF BRONSTEIN



THE GENESIS WAVE

The Italian-made Picco Genesis F1 is still a relatively new chassis, though it bears a striking resemblance to the two-time world champion BMT. It has an impressive list of features, including a unique, fully independent suspension, 4WD, a multiple-speed transmission, disk brakes and quick-change wheel hubs. Special "torsional" suspension springs are mounted on the lower pivot pins between the suspension arms. Adjustable pivot balls offer infinite set-up possibilities for caster and camber and toe-in/toe-out. Nearly all of its components are made of cast aluminum, and this makes the Genesis extremely rigid. The main chassis and upper radio tray are immaculately machined and light, so they're an ideal foundation for a world-class racing machine.

PARIS/SWAUGER CONNECTION

Mike Swauger's winning car is basically stock with a few minor modifications by master mechanic Ron Paris.

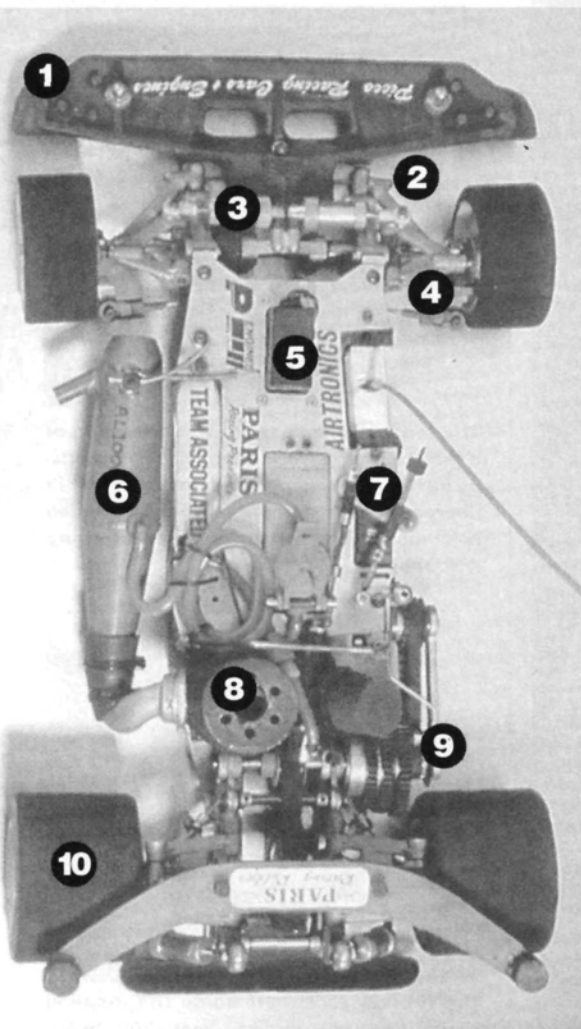
• **Front end.** Unlike the grass-bordered European tracks, U.S.

tracks are bordered by rigid barriers, so two small extensions were added to the front bumper to protect the wheels and tires. This modification also brings the car to the maximum allowable width of 10.5 inches.

For more consistent steering response, the .093-inch front stabilizer is slightly larger than the stock one. The once unique, canted front-suspension design is becoming more familiar to many racers. It provides a decreasing amount of caster as the suspension is compressed.

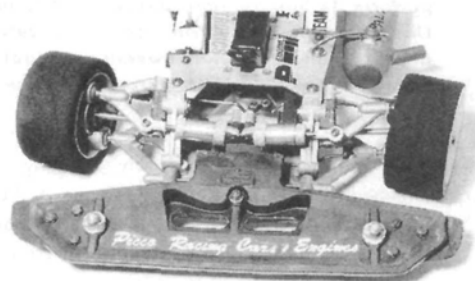
The car's shocks are completely stock. A unique floating piston and compensation chamber help to ensure constant shock volume and reduce foaming in the shock oil. Associated* silicone oil is used both front and rear—60WT up front and 40WT in the rear. Other front-end options include extra-short front body posts, heavy-duty steering arms, heavy-duty tie-rod ends and heavy-duty steering balls.

• **Rear end.** At the rear, Mike's Genesis features a conventional A-arm/H-arm suspension, stock live axle and 3-speed transmission. A

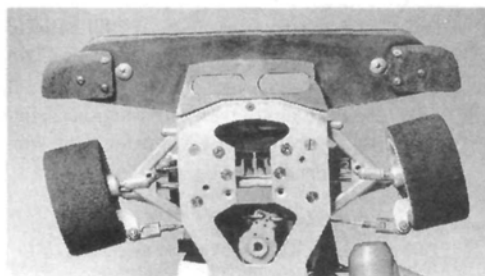


SWAUGER'S GENESIS

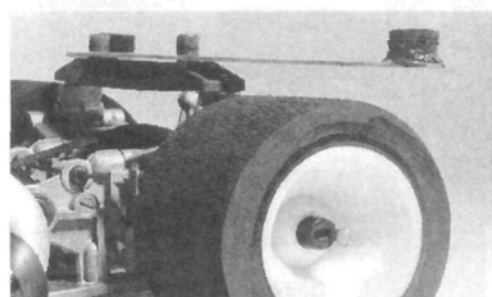
1. Custom-made bumper extensions
2. Larger-diameter, .093-inch front sway bar
3. Oil-filled shocks with volume-compensation chamber
4. Heavy-duty steering linkage
5. Airtronics 94151 Pro Series servo
6. Prototype Paris AL1000 "Stiletto" pipe
7. Airtronics 94737 throttle servo
8. Paris-spec Picco P-5 engine
9. 3-speed transmission
10. Paris racing tires: 35 compound up front, 03 in the rear



The shocks on the Genesis have a unique floating piston and compensation chamber that keep shock volume constant while reducing the amount of air that's trapped in them.



Ron Paris made these custom front bumper extensions for Swauger's Genesis to add extra protection to the front wheels and suspension in the event of a "board encounter."



Like many other 1/8-scale on-road cars, the Picco Genesis includes a quick-change rear tire hub. Quick tire changes can mean the difference between winning and taking second place.



A wide body support at the rear of the Picco actually moves with the rear suspension instead of with the main chassis. This prevents the body from rubbing the ground or the tires, and it makes the Genesis more aerodynamic.

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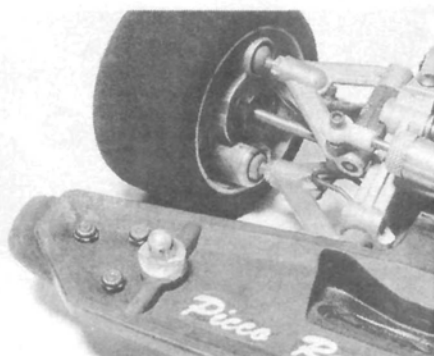
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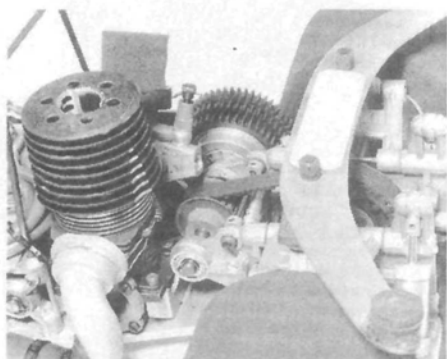
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PICCO GENESIS



The Picco's suspension parts are made of cast aluminum. Notice that the upper suspension arm is canted forward; this decreases caster angle as the suspension is compressed, and it improves steering response.



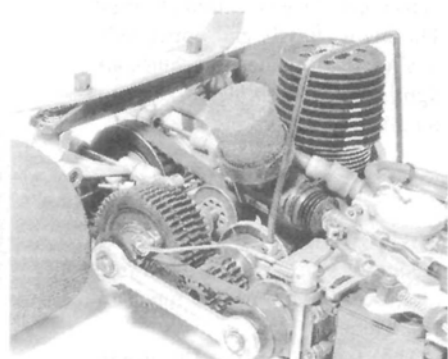
The Picco's jackshaft holds the 3-speed tranny and the front and rear drive belts. Its mounts—and those for the rear suspension—are made of cast aluminum.

fuel-efficient, spring-loaded, five-shoe clutch drives the clutch-bell housing. Each pinion gear is screwed onto the clutch bell separately, allowing virtually any combination of gear ratios. On the complicated Albuquerque track, the multi-gear transmission helped to develop the needed acceleration without sacrificing top-end speed. Finally, a modified Paris-spec Picco P-5 engine, manifold and prototype AL1000, "Stiletto"-type pipe provide maximum killer ponies.

• **Running gear.** Radio receiver, servos, battery and fuel tank are all nestled neatly in the upper chassis tray in the front half of the car, leaving the "business" end free and unobstructed. Swauger's radio of choice is the Airtronics® CS-2P transmitter and standard receiver unit. For quick response, the system uses the 94151 Pro-Series high-speed, ball-bearing steering servo, the standard 94737 throttle servo and a 5-cell receiver battery pack. A McCoy® air filter and 104-9 glow plug let the engine breathe and light its fire. Swauger's car is topped off with an Associated Elfin Can-Am-style



A Paris-spec Picco P-5 engine and prototype AL1000, "Stiletto"-type pipe nestle just behind the car's aluminum radio tray. Mounted on the tray are a quick-fill, flip-top fuel tank and an Airtronics 94151 Pro Series steering servo and a 94737 servo for the throttle.



Holy hi-zoot, Batman! Mike's car uses a trick 3-speed tranny that allows the car to perform its best on both the tight parts of the track and the open spaces. A ball-bearing belt tensioner prevents the belt from coming off during high-rpm operation.

body and, to increase downforce, a wing is attached to the shell. Keeping the car on the tarmac, a full set of Paris rubber rounds out the racing setup—35 compound in the front and a new 03 rubber in the rear.

THE NEXT WORLD CHAMPION?

Swauger's national victory instilled even more confidence in the kid who might be world champion some day. But a racer is only as good as his race car. The Picco Genesis is definitely of world championship caliber, but only time will tell whether it will reach the next level—international success. It's a sure bet that Mike Swauger and the Picco Genesis will be in the running.

**Here are the addresses of the companies mentioned in this article:*

Paris Racing, 4254 Independence St., Chino, CA 91710.
Picco; imported by Tidewater Engineering, 2406 W. Madison Ave., P.O. Box 1135, Bastrop, LA 71220.
Associated Electronics Inc., 3585 Cadillac Ave., Costa Mesa, CA 92626; (714) 850-9342.
Airtronics Inc., 11 Autry, Irvine, CA 92718; (714) 830-8769.
McCoy Racing, 1778 Albright Ave., Upland, CA 91786. ■

Car Action
TRACK REPORT



M R C

DESERT

THE FOLKS AT Model Rectifier Corporation (MRC)[®] have come back to R/C in a very big way. In fact, "big" is the one word that describes MRC's new off-road buggy, the Desert Thunder. (Then again, the words "huge," "giant," or "enormous" might be more appropriate, but I think you get the picture.) MRC boasts that the Desert Thunder—one of its daring new World Scale vehicles—has nearly 50 percent more mass than a conventional 1/8-scale vehicle; in my opinion, however, it's even larger than 1/4 scale.

THUNDEROUS FEATURES

The Desert Thunder is equipped with the latest in off-road racing technology: a narrow bulkhead; a long A-arm suspension; long-throw, oil-filled, aluminum coil-over shocks; an aircraft-grade-aluminum chassis with a 30-degree front-end rake; and a ball-bearing equipped, three-gear racing tranny with an adjustable ball diff and slipper clutch.

The Desert Thunder isn't just an enlarged 1/8-scale "derivative." It has such innovative features as a twin-motor transmission (that's right, two motors) and a twin-servo/twin-

bellcrank steering setup. The Desert Thunder seems to have all the right stuff (and then some), but the question in my mind is: is bigger really better?

When I first saw *Car Action's* preview of MRC's World Scale cars and trucks (in the February '93 issue), I was very excited. I had to call associate editor John Howell anyway, so I decided to "plant a seed" in his head. After we had talked about the business at hand, I asked, "Hey, John, did you get a look at those new MRC cars and trucks?"

He said, "Yeah, they're pretty cool. As a matter of fact, as we speak, I'm having a couple of 'em shipped to us." At that moment, he put me on hold, the tension mounted, and then he came back on the line and said, "Hey, George, how would you like to do a Track Report on the Desert Thunder buggy?" Man, talk about "ask and you shall receive!"

BIG CHASSIS

The Desert Thunder comes with a black-anodized, aircraft-grade, aluminum-alloy chassis that's channeled and formed to provide maximum

Pick On
Somebody
Your Own
Size!



THUNDER

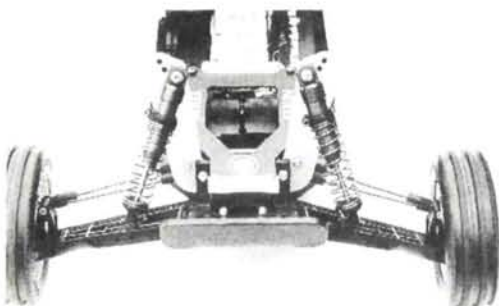
BY GEORGE GONZALEZ

strength and rigidity. The chassis has a 1/2-inch-deep channel along its center, and this allows the transmission and the battery pack to sit below the chassis for a lower center of gravity. The chassis also has an aircraft-aluminum upper plate that provides extra strength and secures the steering bellcranks and the front bulkhead to the chassis.

BIG SUSPENSION

Starting up front, the Desert Thunder features a narrow bulkhead with 30 degrees of kick-up (for high-speed stability) and extra-long A-arms with in-line steering blocks. The A-arms are made of rugged, 1/8-inch-thick, glass-filled nylon, and they're attached to the front bulkhead with the thickest hinge pins I've ever seen. An 1/8-inch-thick fiberglass shock tower has an array of shock-mounting holes that allow precise "track tuning." A complete set of extra-thick, stainless-steel, adjustable tie rods allow camber and toe-in/toe-out adjustments.

In the rear, extra-long A-arms are bolted to



Extra-long front-suspension arms and large-volume, oil-filled shocks allow the Desert Thunder to handle like a champ. The large bumper is tough enough to avoid damage during a collision.

a set of molded A-arm mounts with the same thick, stainless-steel hinge pins as those used on the front. To increase stability under heavy acceleration, the rear A-arms provide a fixed 1.5 degrees of toe-in. As in the front, an 1/8-inch-thick fiberglass shock tower with a variety of shock-mounting holes and a set of heavy-duty, stainless-steel adjustable camber rods are included.

BIG SHOCKS

The Desert Thunder's aluminum-body, oil-filled, coil-over shocks are similar to the ones used on competition-designed 1/10-scale off-road cars, but they're much larger. Take the usual precautions when you assemble them: make sure that you lubricate all the O-rings and nylon washers before you insert the shock shafts. This will prevent the O-rings from tearing, which would cause the shocks to leak.

The front and rear springs are the same, but the kit includes a variety of shock pistons

with which you can alter the shocks' damping action. I followed the instruction manual's recommendation and, as a starting point, I used the four-hole pistons for the front shocks and the two-hole pistons for the rear.

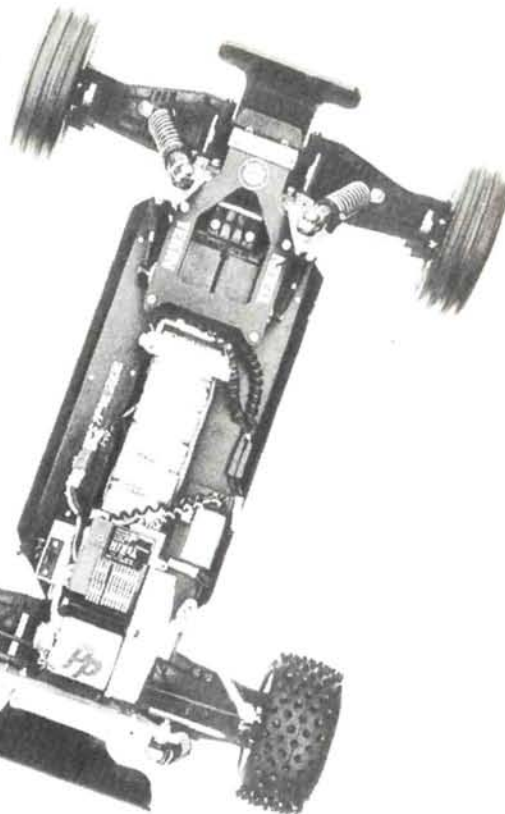
DUELING SERVOS

The Desert Thunder comes with a very trick, twin-servo steering bellcrank system with built-in servo-savers. To use this option, you'll need two servos, a Y-harness and a receiver battery pack. The twin-steering-servo setup dramatically increases torque, and that, in turn, increases the car's stability. You could use a single steering servo instead, but, to maneuver this 6-pound, 7-ounce giant to its full potential, a high-torque servo is preferable.

BIG TRANSMISSION

The Desert Thunder has a ball-bearing-supported, low-friction, three-gear transmission with an adjustable ball diff and slipper clutch. The diff uses 12 large balls and a pair of large diff hex-rings that are completely sealed by the diff housing. A trick, seven-ball, concave thrust-washer set is installed in the diff housing to ensure smooth operation. To adjust the diff, just tighten or loosen the Allen-head cap screw in the right outdrive shaft.

The Desert Thunder has a slipper-clutch setup that's similar in design to those of many 1/10-scale off-road buggies. The clutch uses two Rulon clutch disks. A disk is attached to each side of the spur gear, followed by a clutch ring and a clutch plate. This assembly is then slid onto the top gear shaft and tightened with a conventional clutch spring and a locknut.



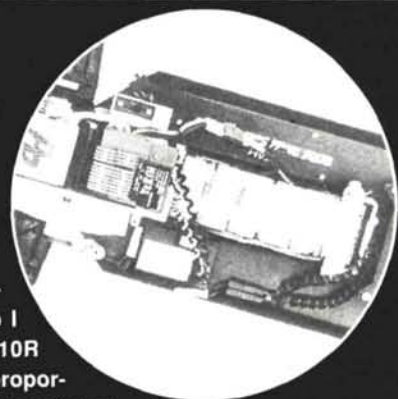
MRC has done an admirable job of designing the Desert Thunder buggy; its layout is clean, and all the major components are easily accessible.

BIG PONIES

A car of this size and weight would be greatly underpowered with a conventional, single-motor setup; to increase torque and top speed, two motors are bolted to the transmission. The twin-motor transmission has a very low, 3.84:1 gear ratio, and it comes with two spur gears and two pinion gears, so you can choose a gear ratio for performance or economy. The transmission is mounted amidships

Hopped-Up Thunder

I wanted to keep the Desert Thunder relatively stock, but I liked the idea of reverse, so I decided to install a state-of-the-art Tekin 610R high-frequency, regenerating ESC with fully proportional forward and brakes—and the added convenience of reverse. To provide the horsepower, I bolted a pair of Peak Performance "Son of a Psycho Stock" 36-degree stock motors to the tranny (wired in parallel, to provide maximum power), and I installed a Sanyo 7-cell 1400 SCR battery pack. I connected the two steering servos to the receiver with a homemade Y-harness, and I installed a 4-cell AA rechargeable receiver battery pack. To complete the performance package, I use a full set of MRC bearings on the front wheels and the rear axle carriers.



blocks and the rear axle carriers to be mounted well inside them; this helps to prevent wheel scrub in the turns. At the rear, a set of low-profile, natural-rubber, nine-row spiked tires are used; a set of four-row, ribbed, buggy-style tires are used up front. This combination seems to work best on medium- to hard-packed dirt.

The Desert Thunder comes with a set of 2.87x1.25-inch (front) and 2.87x1.75-inch (rear) one-piece nylon wheels. The wheels are deeply offset, which allows the front steering

Type2WD off-road
ScaleBig!

Overall length	20.25 in.
Width	13.5 in. (front)
	13.75 in. (rear)
Wheelbase	15.87 in.
Front track	13.25 in.
Rear track	13.25 in.

Gross (with battery)6 lb., 7.5 oz.

TypeSingle-seat buggy
MaterialPolycarbonate

TypeChanneled, formed plate
MaterialAircraft-grade aluminum alloy

PrimaryPinion/spur
Transmission3-gear (3.84:1 ratio)
DifferentialExternally adjustable
ball diff
Bearings/bushings ..7 bearings (tranny),
8 plastic bushings (wheels)

Type (f/r)Independent A-arm
with adjustable upper link
Damping (f/r) ...Oil-filled, coil-over shocks

Type (front)One-piece nylon
Dimensions (DxW) 2.87x1.25 in.
Type (rear)One-piece nylon
Dimensions (DxW)2.87x1.75 in.

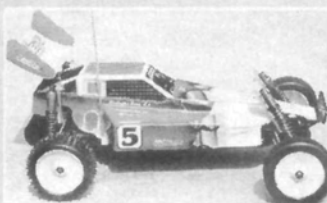
Front 4-row ribbed
Rear..... 9-row spikes

Motor 2 Mabuchi 540s
Battery 6 or 7 sub-C cells
(not included)
Speed controller Mechanical 3-speed
with reverse

Airtronics* XL-2P radio with two 94102 servos, a receiver and a battery-pack switch; Tekin 610-R ESC; two Peak Performance "Son of a Psycho Stock" motors; Sanyo 7-cell 1400 SCR battery pack; Associated antenna mount; a 4-cell AA receiver battery pack and a twin-servo Y-harness.

- Extra-rugged construction
- High-quality, tunable racing suspension
- Ball-bearing-supported racing transmission with a ball diff and a slipper clutch
- Trick, dual-motor setup
- Trick, dual-steering-servo setup
- World Scale size makes the car more stable and easier to drive than 1/10 scale
- Easy to build (perfect for first-time racers)
- Motors and mechanical speed controller included

- Plastic bushings for the front wheels and the rear axle carriers
- Less run time than a smaller, 1/10-scale buggy
- Not as fast as 1/10-scale (in stock form)



The kit comes with a beautifully detailed Lexan body and a trick, adjustable wing that can be adjusted without tools. It's probably the largest racing-buggy body that I've ever seen, and it's made of very thick Lexan that will probably last as long as the car does. Richard Muise of Motion Graphics* is responsible for this masterpiece; I take my hat off to him for coming up with another killer paint job!

The Desert Thunder is one of the most "builder-friendly" R/C kits on the market. First, the obvious: yes, because the parts are larger, the kit is easier to assemble than a conventional 1/10-scale car. Most important, however, the instruction manual is among the best I've seen. Building the Desert Thunder is an enjoyable, relatively easy, 30-step process in which you're aided by many photos and illustrations. The parts come in separate bags that are numbered to correspond to the assembly steps.

Also included in the instruction manual are full-size illustrations and a ruler (printed on each page) that make hardware identification easy. From an entry-level standpoint, however, the fine-tuning performance tips on the last two pages are a little vague. There's no mention of front and rear camber, toe-in/toe-out, or the tuning functions of the kit's additional shock pistons.

Most important, though, nothing is said of receiver battery packs, which, in my opinion, are necessary when more than one servo is used. When you use the mechanical speed controller with the twin-steering-servo option, a total of three servos are used, and you'll definitely want a receiver battery pack for longer run times and to avoid the possibility of glitching because of the servos' power requirements.

You don't need special tools to assemble this giant—just a small, a medium and a large Phillips-head screwdriver, a pair of needle-nose pliers and a bottle of liquid thread-locking compound. The rest of the tools are included in the kit.

The kit's molded parts went together very well and have been manufactured to very close tolerances. On step 9-F, however, I had a little trouble getting the large, 8mm E-clips onto the brass sleeves of the servo-savers. This step requires that you slide the servo-saver halves onto the brass sleeve, then slide

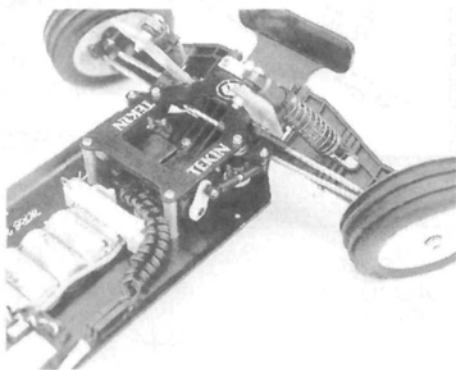
the coil spring over the servo-saver, slide a nylon step washer on top of the coil spring, and then secure the parts on the brass sleeve with an 8mm E-clip.

It sounds easy, but the coil spring has to be compressed to secure the E-clip, and it took me several attempts and three lost E-clips to complete this step. Fortunately, the kit comes with a spare-parts bag that includes extra E-clips, washers, locknuts and diff balls. Way to go, MRC!

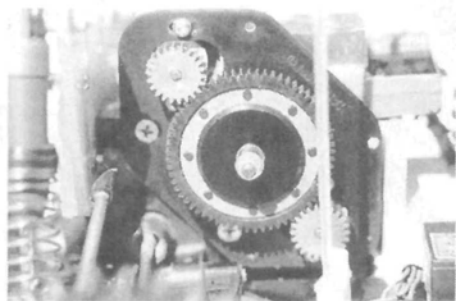
Also, after I had completed the twin-steering-servo installation, I noticed that the bellcranks had some vertical play that caused a clicking sound every time the tires turned from one side to the other. I called MRC and talked to the product engineer, Don Boyce, about my dilemma. He told me that he was aware of this problem, and he explained that the first production run of the World Scale cars and trucks had this flaw.

The problem is that the aluminum posts that secure the steering bellcranks to the upper chassis plate are 0.5mm longer than they should be, and that gap allows unnecessary play. To remedy this, I slid a set of 0.5mm washers onto the aluminum posts.

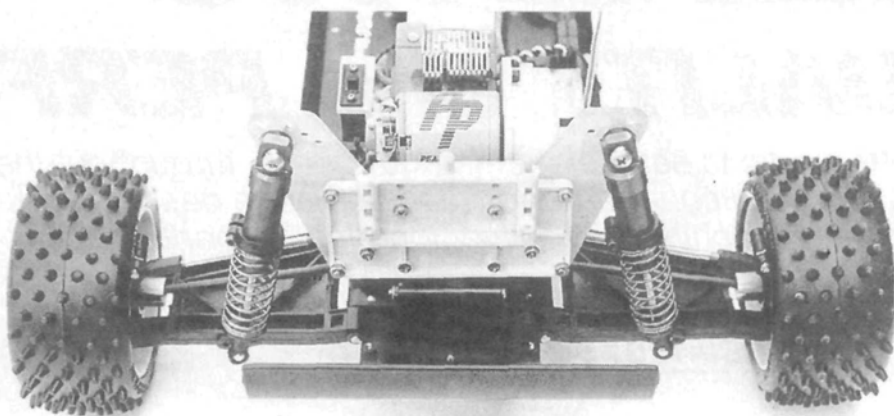
The front and rear shocks are identical and



MRC gives you the option of using two servos to handle the steering. Each steering bellcrank has its own servo-saver mechanism, so you won't strip your servo gears if you hit something.



Twin 540 motors power the Desert Thunder through this friction-type slipper clutch. MRC includes two sizes of spur and pinion gears to provide a broad choice of gear ratios.



you could easily mix them up. The only difference between them is the type of shock piston used, and because the pistons are internal, there's no way to tell the front shock from the rear. I ground a small indentation on the front shocks with a Dremel tool, so now I know which is which!

Also, according to the instruction manual, the rear shocks should be mounted on the lowest hole on the shock tower and on the middle hole of the A-arms. In this position, the shocks had too much down-travel, and the dogbones were at an extreme angle that caused them to bind. I mounted the shocks on the middle hole of the shock tower, and this allowed the dogbones to turn freely through their full operating range without binding.

ELECTRONICS

The Desert Thunder comes with a three-step mechanical speed controller with reverse and a pair of Mabuchi 540 motors. I've been racing R/C cars for more than a decade, so I think I've earned the honor of graduating from the entry-level class, and to be honest, I'd rather seal my eyelids with Zap than install a mechanical speed controller. I did, however, feel obligated to test the controller and stock 540 motors because they were included in the kit, so I decided to test the car with them first, and then with the electronics of my choice.

I think it's great that MRC includes the electronics, because it gives first-time racers the opportunity to get started quickly and economically. At the same time, though, it would be nice if MRC offered a pro version of the Desert Thunder that had a full set of bearings for the front wheels and rear axle carriers—instead of the electronics.

PERFORMANCE

After much anticipation, it was time to unleash the Thunder. I packed my gear and headed out to the Ranch Pit Shop, in Pomona, CA. The track was in pretty bad shape because of rain earlier in the day. It had just dried, and it was very hard and bumpy, but

A beefy, fiberglass shock tower holds the large rear shocks in place and provides a vast choice of mounting positions. As on the front end, a large bumper provides the protection the Desert Thunder needs to withstand a crash.

this made it all the more challenging. I installed a freshly charged, 7-cell, 1400 SCR battery pack, and it was time to rock 'n' roll.

After a few slow passes to get my trims in order, I gunned it. The Desert Thunder took off eagerly and kicked up some dirt as it whizzed by, but the speed wasn't as blistering as I had hoped for. I pulled into the pits to check the diff, but it was adjusted perfectly. I tightened the slipper one-eighth of a turn and headed back out. The Desert Thunder had sufficient low-end torque, but the top end just wasn't there. I quickly realized that this was as fast as it was going to go with the stock powerplants.

The Desert Thunder's handling was very predictable, and the tires seemed right at home on the generally crummy track conditions, but the suspension felt much too soft: the car bottomed-out severely when it came off the jumps, and it had a lot of body roll. The kit's 40WT oil just didn't cut it, so I filled the rear shocks with 80WT and the front shocks with 60WT Associated* pure silicone shock fluid. On the front shocks, I also used the three-hole pistons instead of the recommended four-hole ones.

The Desert Thunder now lived up to its reputation. It flew nose-up off the jumps and landed as if it could take jumps that were five times larger. It pushed slightly in the corners, but, fortunately, the low-end torque from the dual 540 motors was enough to correct the problem.

On my third battery pack, disaster struck. The receiver battery pack probably wasn't fully charged, because the car suddenly took off—out of control—and wedged itself in the chain-link fence behind the track. By the time I reached it, the mechanical speed controller was history.

At that point, I decided to add my performance package (see sidebar). By the time all

(Continued on page 118)

GASTRONOMIC DELIGHT

PHOTOS BY A.R. FLATBUSH

by A.R. FLATBUSH

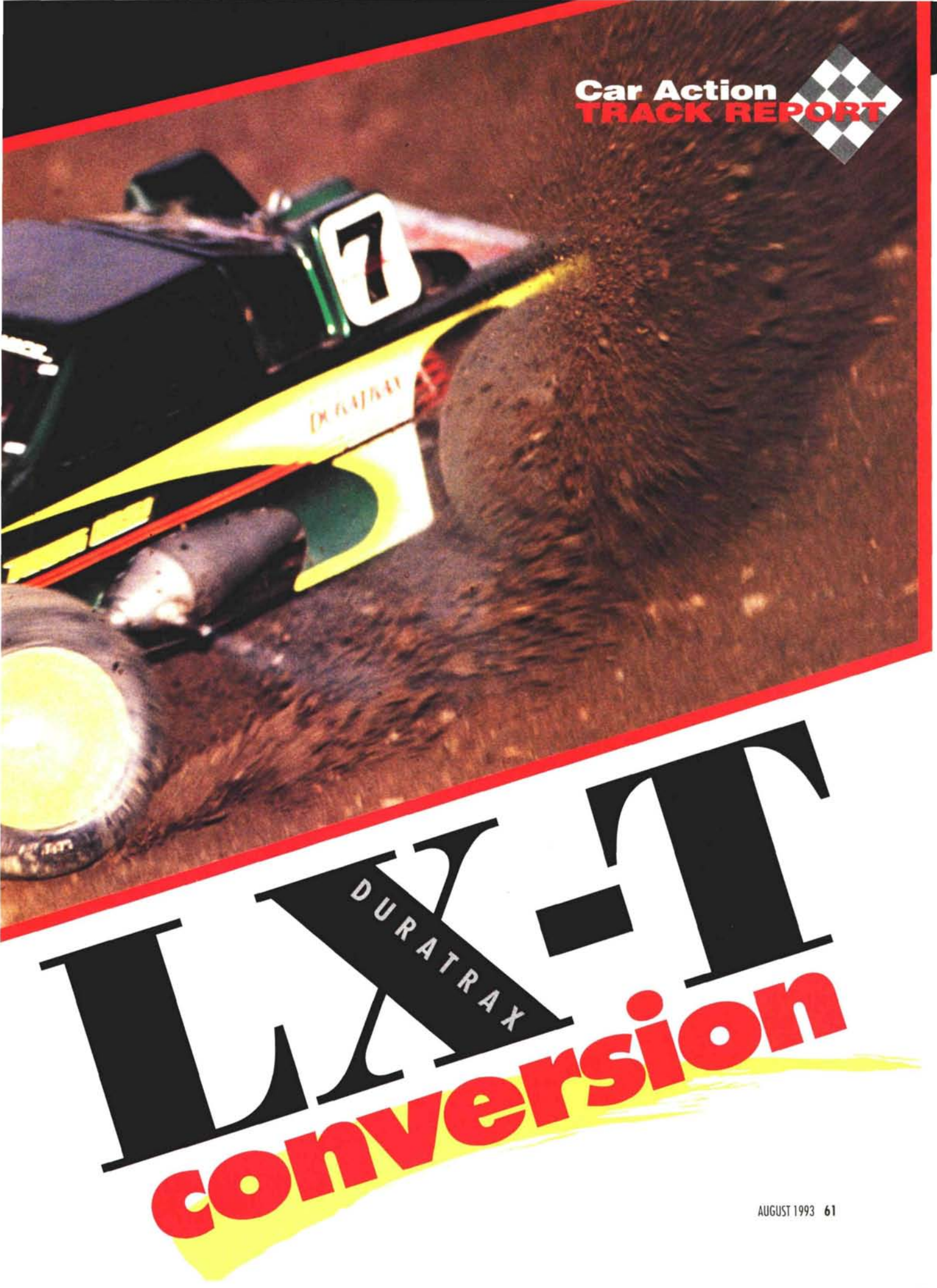
ALMOST all Japanese and European R/C manufacturers offer gas-powered versions of their electric cars and trucks. Kyosho, Yokomo, Panda and Schumacher all have off-road gas rockets in their lineups, but nitro power hasn't made a really big splash with stateside manufacturers—until now.

Traxxas has stepped up to the nitro pump with the Nitro Hawk (an Eagle LS converted to gas power), and the others are hot on the trail. DuraTrax, A-Main Racing and Moody have already developed gas conversions for the ultra-competitive Losi LX-T and Associated RC10T, and Team Associated is rumored to be in the prototype stages with their own gas truck.

DuraTrax* has done extensive R&D to develop an LX-T gas conversion that uses the fast, reliable O.S. CZ-R engine, an aluminum heat-sink chassis with a fiberglass radio plate, a centrifugal clutch and a chain-driven, Losi-style ball differential. The result may well set the gas world on its ear!



Car Action
TRACK REPORT



LXT

DURATRAX

conversion

THE DURATRAX LX-T CONVERSION KIT

For the conversion, you use your Losi* LX-T's steering and front-suspension assemblies, rear shocks and suspension arms, bearings, tires and wheels, assorted diff and tranny parts and some odds-and-ends such as the body and hardware. The LX-T conversion is available with or without the CZ-R engine, although I have no idea how you'd beat DuraTrax's price on the CZ-R and slide-valve carb—unless your last name is Kyosho.

Besides the user-friendly pull-start engine and carb, the kit includes servo linkages for the throttle and brake, diff cases and chain-driven gears, a bearing-supported clutch/pinion assembly, a pre-drilled aluminum chassis, a rear shock tower, a chassis stiffener, a fuel cell, an air filter and all the hardware you'll need to convert your LX-T to full-on nitro power, except a receiver battery pack,



The DuraTrax LX-T conversion chassis has the same wheelbase as an LX-T that's set up "long." I tried a helicopter one-way stop-valve (look by the air filter) in the pipe/tank pressure line, but it malfunctioned after the first rollover.

DURATRAX LX-T CONVERSION

Scale1/10
Price\$369.95

DIMENSIONS:

Overall length15.5 in.
Width12.5 in.
Wheelbase11.5 in.
Front track12.5 in.
Rear track12.25 in.

WEIGHT:

Gross (with battery)3 lb., 9 oz.

CHASSIS:

TypeTwo-piece plate
MaterialAluminum/graphite

DRIVE TRAIN:

PrimaryPinion/spur
TransmissionChain-powered pinion/spur
DifferentialBall
Bearings/bushingsBearings

SUSPENSION:

Type (f/r)Independent single A-arm
Damping (f/r)Oil-filled, coil-over shocks

WHEELS:

Type (f/r)Nylon disk w/cover

HITS:

- Centralized design • CZ-R motor and slide-valve carb • LX-T handling with gas power
- Excellent servo mounts and control links • Upper plate is removable for cleaning

MISSES:

- Chain stretch • Rear-end flex and protruding bolts • No slipper clutch • Exposed diff gets gritty • "Smallish" fuel cell, no flip-up cap



Dimensions (DxW)2.2x2.0 in.

TIRES:

FrontRibbed
RearStep-pin

POWERPLANT:

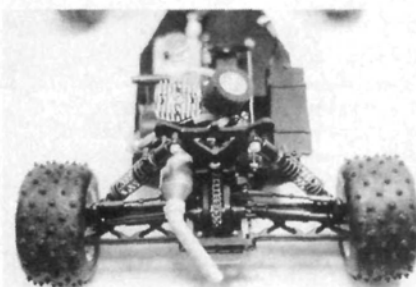
EngineO.S. .12 CZ-R
PipeDuraTrax
CarbDuraTrax slide-valve

OPTIONS AS TESTED:

Futaba* Magnum Sport radio, 112JE receiver and two S148 servos; DuraTrax/Panasonic KA600mAh 5-cell receiver pack; silicone exhaust-pipe extension; rubber cover for carb; in-line fuel filter; MIP* Losi SE steering sector arm.

a glow-plug igniter and fuel.

The DuraTrax conversion comes with detailed instructions and well-organized parts bags. It doesn't come with the tools you'll need to make the conversion, thread-locking compound, or diff grease, but you have these already, right?



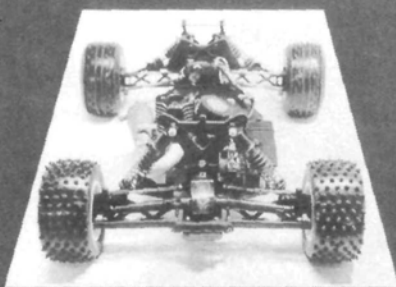
The design is clean and simple, but the wire chain and the exposed diff are weak links. The chassis could also use a stiffener that links the radio plate and diff cases.

BUILDING THE BEAST

To ready your LX-T for methanol and nitro, remove the front bulkhead and steering assemblies, the radio gear, the rear shocks and fasteners, the rear suspension arms and pins and the transmission. You'll need the four 1/4x3/8-inch outdrive bearings, the outdrive hubs and the sliders from the stock tranny, too. The kit also uses the Losi upper links and ball ends and your servo-saver, so set them aside.

The first words you'll read in the instructions are "use thread-locking compound wherever screws enter metal." I didn't use just any compound, I went with "red" stud Loctite. Believe me, anything less than

LX-T CONVERSION



Use a Lexan cover to keep grit out of the exposed diff and chain. I set the diff really tight and used Loctite red on the thrust-assembly screw. It worked into a normal setting after two runs.

Conversion Tips

When I built my DuraTrax LX-T gas conversion, I noted trouble spots and the ways in which I could improve assembly. Here they are, in no particular order:

▶ Notch the right tranny case at 12:00, above the pinion gear, so that you can get a straight shot at the pinion setscrew.

▶ I had trouble with the diff's adjustment screw (it kept backing out) until I applied red Loctite.

▶ Oil the K&N-type filter and use an outer wrap (available from DuraTrax).

▶ Notch the top of the left side's rear inner rod end, and use the lower row of holes on the axle carrier, or the pipe will rub against the camber arm and limit left rear-wheel travel.

▶ Cut out one third of the windshield area and all of the left side window to provide cooling to the engine's heat-sink head.

▶ Unless you add a 45-degree silicone extension to the end of the pipe, it will "drool" all over the body, the exposed diff and the chain.

▶ Some assembly steps require a tap set, which I don't have. With your Dremel cutting wheel (I hope you have one), convert a screw to a tap by cutting a groove along the tip of the screw. The sharp edge on the threads cuts the plastic, and the groove allows shavings to accumulate out of harm's way. It works!

▶ Besides the thread-locking compound, the receiver pack and the helicopter fuel filter, you'll need a glow-plug heater and charger; after-run oil; 15 or 20 percent nitro; and denatured alcohol and lots of cotton swabs for cleaning. Methanol is corrosive stuff if left inside the engine, so after-run oil is very important!

"blue" will act like Liquid Wrench when your stadium terror is doing 20,000rpm. Use it or lose it—all over the track! Two pages of the instructions outline engine and drivetrain construction, and then the manual splits off into RC10T and LX-T conversions.

Both the LX-T and the RC10T use an O.S. .12 CZ-R motor with a DuraTrax slide-valve carb and a centrifugal two-shoe clutch bell. The 13-tooth clutch bell/pinion gear and 60-tooth spur gear are 32-pitch and provide a ratio of 4.62:1. The spur is bolted directly to an aluminum brake drum and the

The only hard part is realizing that the thrust-bearing assembly rides within the right output hub on the conversion, and adjustment of the ball diff requires removing the right hub's U-joint. The thrust bearing balls are .093-inch, just like the center diff balls (for added load-carrying capacity), and they're held in by the hub itself.

The only part that didn't fall into place was the brake arm, which rides on a threaded shaft with an outboard E-clip. It took a couple of tries to line it up parallel to the brake drum. Be sure to squirt some red Loctite on

HOP-UPS AND LOSI SET-UPS

■ Hydra Drive conversion.

DuraTrax is working on a Hydra Drive conversion kit that will include the slipper shaft, the drum brake and the spur gear. A trick, lightweight fly-wheel and clutch are in the works, as are billet-aluminum cases.

■ Axing the pull-starter.

DuraTrax has a Kyosho* header pipe (no. SGW-1) that will work without the pull-starter. Replace the recoil starter assembly with the motor plate (you'll have to cut off the end of the crank). I might go back to the pull-starter, so I installed a 2mm spacer (made out of a Losi rear shock tower) between the motor case and the motor plate, and this saved the crank from the wrath of the Dremel.

■ Hop-up parts and accessories.

DuraTrax also carries Stage One and Stage Two heat-sink heads (I chose the Stage Two), tuned pipes, filters and wraps, receivers, batteries, tires and wheels, fuel and a Chevy body for the conversion.

■ **Paris pipe.** Paris Racing Products* makes a ROAR- and NORRCA-legal Sport Pipe for 1/10-scale gas cars. The Sport Pipe goes for \$22, and the 90-degree pressure fitting is \$3.95. You might find a pipe that makes more



The DuraTrax recoil-starter-eliminator plate cuts down rotating mass and allows the truck to gain revs more quickly. I had to match the Kyosho/DuraTrax header to the CZ-R exhaust port. The Paris Sport Pipe boosts power considerably, especially in the lower revs.

power, but it probably won't be race-legal!

■ **Titanium tie rods.** Tecnacraft* makes titanium turnbuckles and hinge pins that strengthen the package and save weight.

■ **Hot tires.** Pro-Line* has new XTR compound tires (no. 65 front and no. 150 step-pin rear) that I matched to dyeable stadium wheels. I gave the rears the foam treatment before I glued them.

transmission's jackshaft, with no provision for a slipper clutch. A 35-link chain is driven by an eight-tooth sprocket (that's attached to the jackshaft) and drives the ball diff through an 18-tooth diff sprocket.

If you understand how your Losi diff and tranny operate, you won't have trouble building the conversion's diff. From your Losi diff, you'll need only the molded outdrives and the diff bearings; DuraTrax supplies a set of machined steel diff hubs, new diff balls and thrust-bearing balls, washers and cone washers. Also, you get a diff adjustment screw and a set of Stealth diff rings.

the setscrew that holds the top sprocket to the layshaft.

The receiver pack counter-balances the mid-engine CZ-R powerplant. (The battery plate is designed for a 5-cell KA600mAh stick pack, which is available from DuraTrax.) This design is mass-centralized, so there's more weight on the front wheels, and this enhances turning.

I put the kit together in an evening, and only minor makeovers were required. See the "Conversion Tips" sidebar for more wrenching reports, because I wanna talk about driving the gaseous way!

TAKIN' TO THE TRACK

Remember how lost you were when you first tackled electric 1/10-scale off-road racers? I was really lost, but experience with several Losi cars and trucks taught me the basics of off-road R/C setup after a while. I didn't know if I had the patience to start from scratch in the nitro world and deal with the unknown world of nitro tuning and maintenance.

Being more familiar with LX-Ts than with the stuff growing in my navel, I figured that the DuraTrax conversion wouldn't be a whole new world. I wasn't braced for the adrenaline rush that burning nitromethane produces, or the blinding speeds, though. The DuraTrax conversion handles just like the electric LX-T—if you built one with twin 12-turn modified motors and a 12-cell pack—but the rear really flexes more than

Even if you're starting from scratch, the DuraTrax conversion is a great way to get into gas.

the Stiffezell Losi chassis and rear bulkhead. This makes the gasser take a weird hop every now and then, but otherwise, handling is very Losi-like.

That's a good thing, because the power is awesome, and the conversion I tested didn't have a provision for a slipper—much less a Hydra Drive system. The power comes on fairly strong in the lower revs, then it smooths out through the midrange and upper revs. Even with the minimal exhaust tuning (no header or first cone), the power is really impressive, and it's sure to hook you on nitro.

The power is so potent that it will override the stock step-pin rear tires. The offset 6-rows or Diamond series 10-rows offer more traction, and I had to go to a heavier shock oil to deal with the increased chassis roll in the corners.

The manual advises that you set the brake to coast when the radio trigger is in neutral. This correlates to electric ESCs, where you have to push the trigger forward to hit the brakes hard. That's the way my Novak ESCs are set, so this setup is natural to me. The DuraTrax conversion flies levelly because it's a mid-engine, and it requires few midair corrections, but the cork brake comes in handy in emergencies.

Besides the lack of a slipper clutch, the only things that I could find to snivel about are the protruding engine bolts. When it lands after a jump, the car uses all its suspension travel, and the aluminum chassis slaps

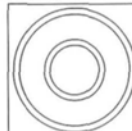
(Continued on page 118)

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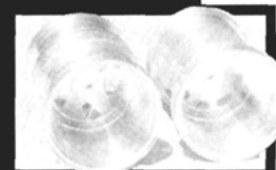
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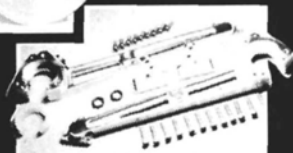
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TROUBLESHOOTING

by FRANK MASI

If you have a technical problem that your hobby shop or racing friends can't resolve, give us a shout at Radio Control Car Action, and we'll see if we can chase down an answer for you. Questions should be of a technical nature and should be addressed to Troubleshooting, Radio Control Car Action, 251 Danbury Road, Wilton, CT 06897. We regret that, owing to the tremendous number of letters we receive, we can't respond to every one.

Bones vs. Shafts



When we received the following letter, we figured that we'd go right to the source for the answer, and Team Losi's Jack Johnson was happy to oblige.

I've been in R/C for a while now. A few weeks ago, I bought a used, rebuilt Losi JRX Pro, and I installed a Novak T-1 speed controller, a Futaba radio and a Trinity stock motor in it. The tranny is turned around in a "mid"-type style, and boy, is it fast! If I put dogbones in to replace the slider shafts, would it be faster or more efficient? Which one do you prefer?

DAVID MESEY
Imperial, MO

We're often asked this question. Which is better: dogbones or sliders? The truth is that they're just different. One isn't necessarily better than the other, and one won't make your car faster than the other.

Given the bind—or drag—of the dogbones, I'd have to say that the sliders are just slightly more efficient. Each dogbone has a pin that slides in and out of the tranny outdrive's slot. When there's a load on the pin, there's a slight power loss. The sliders work more like a universal joint. Each has a yoke that rotates between the two shafts. This yoke doesn't have a pin that slides in and out of a slot. Therefore, the sliders are slightly more efficient.

Because of the way that they make the car handle, dogbones are becoming more and more popular with car manufacturers. Under acceleration, the dogbones create drag that works a little like a sway bar. In other words, when the car accelerates, the chassis stays flatter. Since the sliders have less bind, they let the chassis roll a little more, but, for this same reason, they're slightly better on very bumpy tracks. The dogbones don't move as freely, and this causes the suspension to bind up slightly.

Jack Johnson

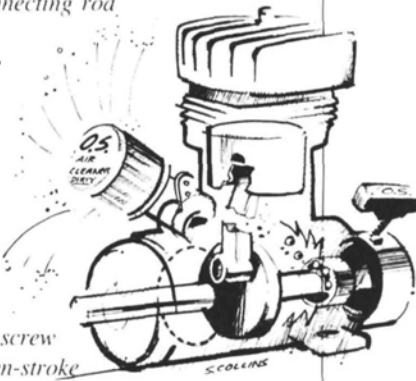
CZ-R Seize

I've had to replace the connecting rod on my Rampage's O.S. CZ-R engine three times and the piston and cylinder twice because the connecting rod broke where it's attached to the crankshaft. I've followed the factory break-in procedure to the letter, and I've been careful not to run the engine too lean or to over-rev it. I use Omega 15 percent fuel. I know others who have had this irritating and expensive problem.

JOHN GERMACK
Dothan, AL

The problems that you're experiencing with your CZ-R aren't common. According to Great Planes (U.S. distributor of O.S. engines), there haven't been too many cases of connecting-rod failure with this engine—and three in a row is unheard of! This leads me to believe that the problem lies elsewhere—not with the connecting rod or with the piston and sleeve.

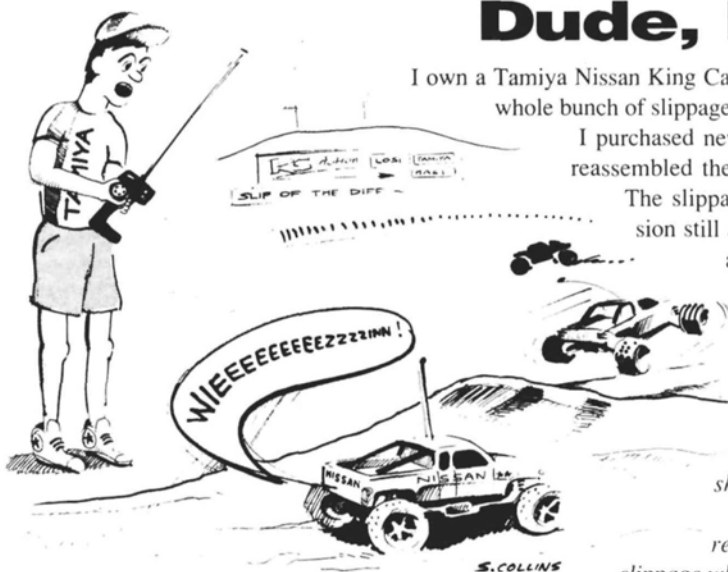
Probably, dirt or some other contaminant is entering your engine case and wreaking havoc. Particles can get into the connecting-rod bushing (on the crankpin and the piston's wristpin), and, through abrasion, they can enlarge the bushing. This will totally screw up the pistons' up- and down-stroke and cause the type of damage that you've described.



Let's ascertain how debris might be entering your engine. Unless you've modified the engine, it still has the Kyosho pull-start mechanism, which uses a one-way bearing. This bearing might be shot and is allowing dirt to pass through it into the engine case, or it's disintegrating and crumbling into the engine. Check this bearing and replace it if necessary (manufacturer no. FD-45 or Tower no. KYOC4695). You can buy the O.S. pull-start mechanism, which is a higher-quality unit (part no. OSMG2910). If the bearing is not the culprit, check your air filter; if it's not kept clean and properly oiled, it will allow dirt to enter and contaminate the engine. Also, keep tabs on your engine's temperature; if it's running too hot, it will cause damage.

O.S. has recently upgraded the engine's connecting rod so that both ends now have bushings. This should enhance performance and increase reliability.

Dude, It's Your Diff



I own a Tamiya Nissan King Cab. Last summer, its transmission started to allow a whole bunch of slippage. (When the truck was new, it didn't slip at all.) So, I purchased new gear-box joints and a ball thrust bearing bag. I reassembled the entire drive train and the differential spur gear.

The slippage has decreased considerably, but my transmission still allows a little. Is my Nissan King Cab intended to allow slippage, or is there something wrong? Thank you for your time and information.

WESLEY OISTAD
Eagle River, AK

To answer the second part of your question first: the differential in the King Cab's transmission should be set to allow some slippage, but not an excessive amount. When it has been set correctly, the King Cab's diff should allow 1 to 2 feet of slippage when the truck does a full-power takeoff from a dead

stop. If the diff is allowed to slip more than this, the excessive heat buildup (caused by friction) might damage it.

Now, to deal with the first part of your question: it sounds as if you've initially built and adjusted the diff properly, but to keep it performing up to its potential, you must periodically check and then readjust it. The more you run your truck, the more the diff will wear. The diff balls wear tiny grooves in the pressure washers, or plates. As the grooves become deeper, the pressure on the diff balls decreases, and subsequently, the diff becomes "looser." To prevent this, put another small shim on the diff adjustment screw. This will place more pressure on the diff balls and "tighten" the diff.

Spin-Out King

Maybe you could help me. I have a Traxxas TRX-1. I recently bought a Twister Hurricane wet-magnet motor, and I have a Novak 410-MXc ESC. The car has mini-pin rear tires and an Airtronics 94151 Pro Series steering servo. Here's the problem: when I'm at the track, my car spins out when I barely even turn.

BRIAN MOORE
Belvidere, IL

Let's first make sure that you're using the correct rear tires for the surface upon which you run. You mentioned that you're using mini-pin rear tires, but, generally, these work only on hard-packed dirt. If you use these tires on loose, fluffy dirt, they won't provide your car with much rear traction. For this condition, try using tires with larger, widely spaced spikes. Also, you might be using the right type of tires, but you should replace them if they're excessively worn. If you don't want to spend the money on new tires, you can cut the spikes down a little using a good, sharp pair of Lexan scissors or side-cutters. If you cut only enough

material from each spike to make its edge square and sharp, you can dramatically increase the tire's traction.

As far as your setup goes, you can cure the oversteer, or spinning-out, problem by making a few changes to its suspension. Adding toe-in to the front wheels will make the car more stable when it exits turns; also, it's very important to set your car's rear toe-in correctly. The TRX-1 comes with both 0-degree rear-arm mounts and what's called "plus or minus" rear mounts. The rear arms have 3 degrees of toe-in molded in. Using the 0-degree arm mount will give each side of the car exactly 3 degrees of toe-in. By using the "plus or minus" mounts, you can either add 1 degree of toe-in (by mounting the block to the car with the "plus" sign facing rearward), or subtract 1 degree of toe-in (by attaching the mount with the "minus" sign facing rearward). To increase

rear traction, you should run the most rear toe-in possible, which, in the TRX-1's case, is 4 degrees (1 degree from the arm mount and 3 degrees in the arms themselves).

Softer rear shocks will also help your car gain more rear traction. If you plan to use softer springs, make sure that you use lighter shock oil. Be careful, however, not to use oil that's so light that the car will bottom-out easily. You could also try to stiffen the front shocks, but this will decrease steering response.



Diff Meltdown



bought a new set of diff gears reassembled the diff. The same thing happened again. I built

and lubricated the diff exactly according to the instructions. Could I have switched the thrust-bearing balls with those intended for the diff gear? Or have I set the diff too tight? Please help!

JESSE BURKE-ALLMON
West Linn, OR

A "lunched" diff gear is a common problem with off-road cars and trucks that don't use slipper clutches. With a slip-

per, the differential is set so that it's "locked," i.e., it won't slip under any circumstance, and the slipper clutch is left to do all the dirty work. The cause of your problem is a maladjusted diff. A setting that was far too loose caused the diff gear's "meltdown;" this setting allowed the diff—not the slipper clutch—to slip. The slippage caused a massive heat build-up, and poof!—there went your diff gear!

Here's my advice: get new parts, and rebuild your diff. Make sure that you replace the nylon locknut that secures the long diff-adjustment screw. This nut prevents the diff from becoming loose. You should replace it each time you rebuild the diff. Reinstall the

diff in the transmission, and then mount the tranny in the truck. Now comes the easy part—setting the diff and the slipper. Mount the rear tires, but don't install the motor yet. Lock the slipper down all the way, and, as you hold the rear tires to prevent them from spinning, try to rotate the spur gear by hand. It should be nearly impossible to rotate the gear. If not, tighten the diff until it is. Then, loosen the slipper-clutch-adjustment nut until the spur gear starts to rotate fairly easily. Make the final slipper setting on the track. Make a few full-power takeoffs from a standing stop (best made on your track's most slippery section), and adjust your slipper so that it slips about one foot.

I own a Team Losi LX-T that uses a 17-tooth pinion gear and a Speedworks 427 modified motor. A couple of days after I got the truck, I noticed that only one rear wheel (the one nearest the slipper) was actually driving. I took the diff apart and found that the center gear had melted onto one of the side gears. I couldn't see the diff balls, and it took a great deal of cutting to get them out. Then, I

Caster Disaster

About two months ago, I bought a Team Losi LX-T at a hobby shop that also holds weekly races. I've been racing and doing pretty well with my truck on the asphalt oval track. I use Losi's six-row, ribbed truck tires on both the front and rear. I wanted to know about the 30-degree front kick-up angle. When I turned, both tires lost a lot of traction off the ground. So, I changed the camber of the left tire to 5 degrees positive and the right tire to 5 degrees negative. This seemed to help a lot, but are there any front bulkhead or caster blocks that can eliminate about 20 degrees of caster? I would appreciate your help, and I love your magazine.

DEREK WOO
Scottsdale, AZ

Well, Derek, the LX-T is designed to run on dirt, which is why it has a 30-degree front-end rake angle. This rake—which is also the truck's caster angle (the amount, in degrees, that the tops of the front kingpins lean rearward)—helps the truck to turn in when it enters corners. Caster helps the tires compensate for chassis roll and keeps them upright in the turns

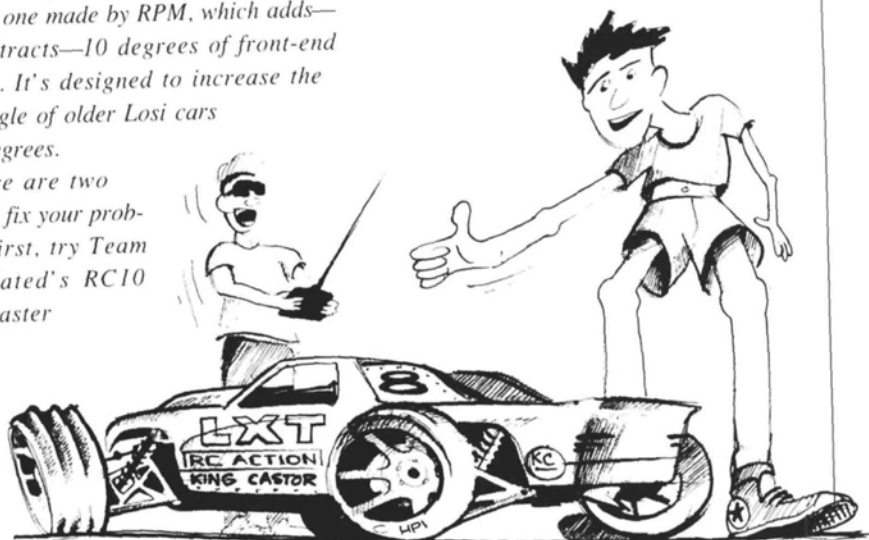
instead of leaning with the chassis. This affords better traction. Since you're racing on asphalt, I'd guess that you're using very stiff springs and/or heavy shock oil, and this is limiting the amount of chassis roll that your truck is experiencing. When the chassis doesn't roll, the caster angle tends to diminish the front tires' contact with the ground—which is exactly what you're experiencing.

I did some checking, and the only bulkhead I could find for Losi cars and trucks was the one made by RPM, which adds—not subtracts—10 degrees of front-end kick-up. It's designed to increase the rake-angle of older Losi cars to 30 degrees.

There are two ways to fix your problem. First, try Team Associated's RC10 front caster blocks

on your LX-T. They're available in varying degrees of caster, and if you use ones with 5 or 10 degrees of caster, you can sufficiently reduce your LX-T's caster.

Second, you can soften your truck's suspension to allow its chassis to roll enough so that the 30-degree caster angle increases the tire's contact with the ground. Doing this, however, will tend to diminish the truck's steering response and make its handling seem sluggish.



More Cheap Paint Tricks

IF YOU'VE BEEN following this series of "how-to" painting articles, you've probably figured out that many of the paint jobs that look really complicated are just good presentations of relatively easy tricks. This month, I'll show you two new "Cheap Paint Tricks" that are so easy, they're almost embarrassing! One of these tricks doesn't even require masking!

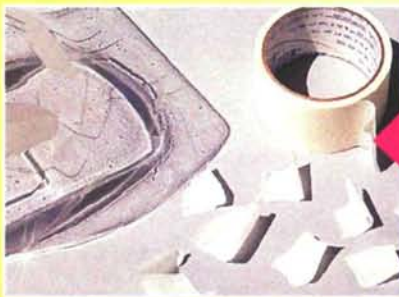
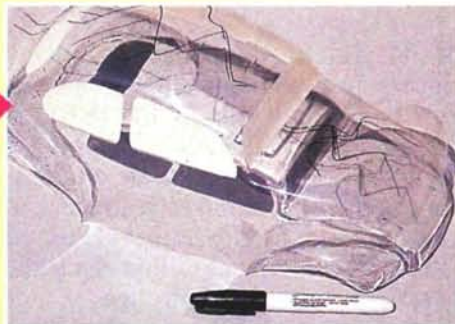
by MIKE OGLE



1 Let's start things rockin' with the "earthquake" paint effect. As with all paint jobs, the first thing you have to do is mask off the inside of your windows. If you use 2-inch-wide masking tape, you can usually cover all the side windows with just one piece and the larger windshield area with two. Then, hold the body up to the light, and carefully trace around the molded-in window lines with the tip of a new, sharp, no. 11 hobby-knife blade. It's important to use a relatively new blade; with one that's even slightly dull, you'll have to use a lot more pressure to slice through the tape.

Again, don't worry about cutting through the body. If you're applying that much force just to slice through a couple of layers of masking tape, you have either a really dull blade, or a promising career in the WWF.

2 When that's done, flip the body over, and use a Sharpie marker to roughly sketch out just where the "fissures" will go on the outside of your car's body. These marks are just guidelines; you'll wipe them off with denatured alcohol later.



3 Put the body aside for a few minutes, and tear out a bunch of 1- to 2-inch "squares" of masking tape. Yes, tear! The idea is to not leave any straight edges on the tape. And—now here's the fun part—the more irregular these pieces turn out, the better! If you want this step to go faster, ask someone to help you rip. Don't stop until you have at least 25 pieces. (If you need more, you can tear them out later.)



4 Now, start putting these little pieces of tape on the inside of the body, right next to the drawn-on "crack." Loosely edge the crack with these irregular-shaped pieces of tape.



5 Continue until the rest of the car's body (except the "cracked" area) is covered. As a finishing touch, throw a couple of small torn pieces of tape right into the main crack. These will appear to be falling "chunks" of body when the paint job is finished.

Earthquakes

& lightning



PHOTOS BY MIKE OGLE

6 As you may have guessed, since the only thing unmasked at this point is the cracked area, we're going to paint that first. You have a couple of good options here. If you make the crack a bright color, like a fluorescent orange or red, and you spray the body a dark blue or black, you'll give the appearance that the cracks are like hot, glowing volcanic lava coming up through the surface.



7 If you spray the crack a darker color than the main body color, you'll create the appearance of a deep crack in the surface. When you've finished spraying the cracks, peel off all the tape (except for the windows) and spray your main body color. If you have an airbrush, you can fog around the edges of the crack with a contrasting color to give a 3D effect to the surrounding areas.

5 Spray a stripe of Pactra's Pearl Purple along the length of the bolt. This paint is very thin and transparent, and it will be almost impossible to see...until you finish by spraying the entire body black. Then, the Pearl Purple will show up as a brilliant deep-blue when viewed from certain angles. This "bonus" Cheap Paint Trick (Pactra's Pearl Purple backed with black) gives one of the most dramatic flip-flop color effects you've ever seen!

1 To do a realistic lightning-bolt effect, you don't have to mask anything but the windows! This is a true "no-tape" paint trick that produces a surprisingly good effect!



almost impossible to do this incorrectly; lightning bolts don't follow a set pattern.

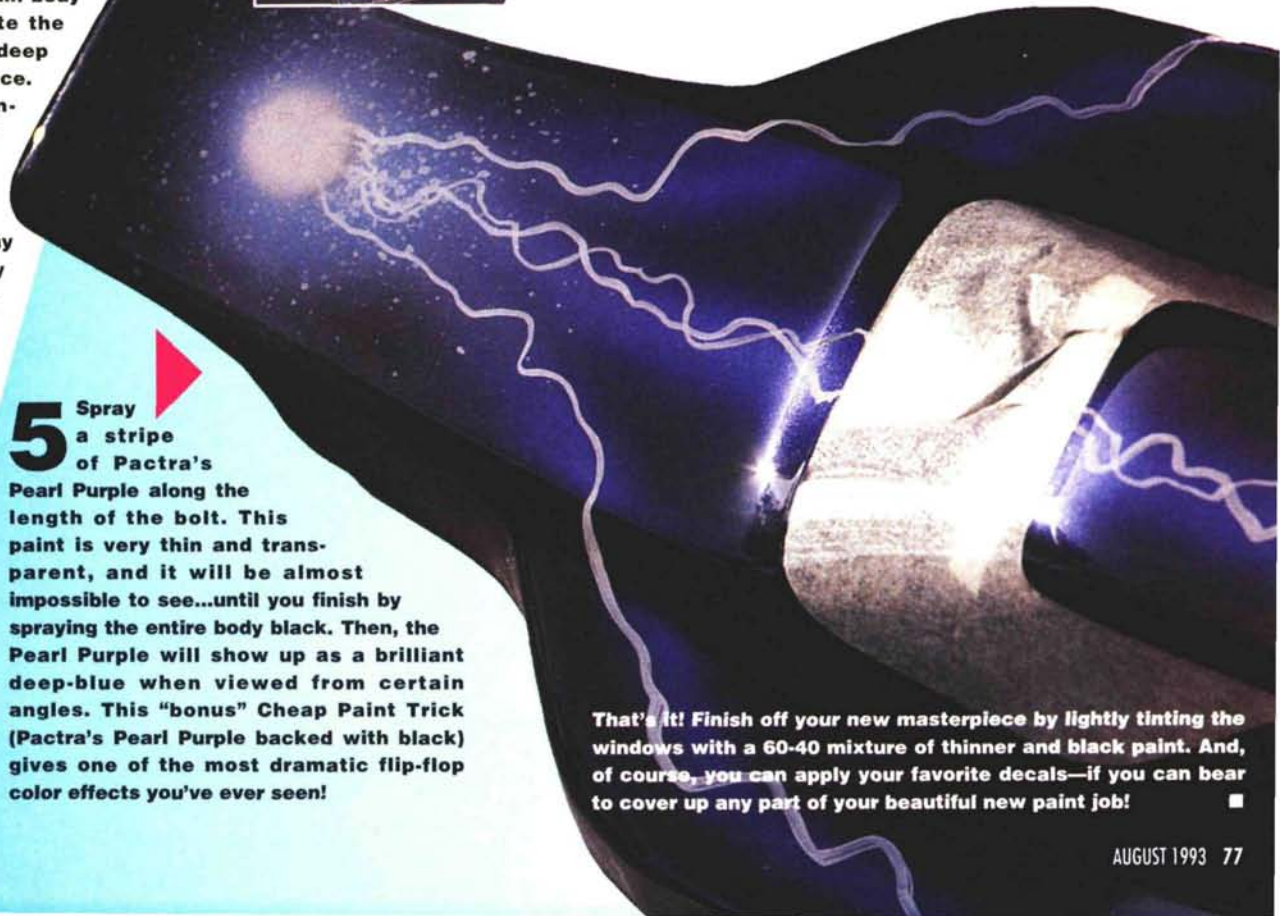
3 You might want to "double" the bolt with a smaller, more squiggly line, or add additional bolts that converge at the same point on the hood. If you're very good with an airbrush, you can do these bolts as thin airbrushed lines, and they'll look even more realistic.



4 I like to converge several bolts in a small "burst" of pure white/light blue sprayed from an airbrush. This gives the appearance that the lightning bolts have struck there and exploded! You can further elaborate on this illusion by finely splattering some white paint right around the burst with an old toothbrush—it will look like flying sparks!



2 After you've masked off all the window areas, take a brush and some white paint and paint a squiggly line down the middle of the body (wide at the rear and gradually getting thinner as you get to the nose). It's



That's it! Finish off your new masterpiece by lightly tinting the windows with a 60-40 mixture of thinner and black paint. And, of course, you can apply your favorite decals—if you can bear to cover up any part of your beautiful new paint job!

RADIO CONTROL CAR ACTION

RACER NEWS

WORLD - C L A S S R A C I N G

Fuzzie logic from Pro-Line

Despite a fairly hectic schedule, I frequently visit quite a few tracks and talk to the local racers. One of the most common questions I'm asked (what, am I some kind of authority or something?) has to do with off-road tires. Specifically, racers want to know about tire designs and compounds. They want to know why mini-pin spikes work when tires with larger spikes won't, and they all seem confused about rubber compounds. Why, for example, is a softer compound tire better on certain tracks?

Though I pride myself on being up-to-date when it comes to R/C technology, I thought it would be better to go right to the source for the answer to this one. Pro-Line, in my mind, is one of the hottest manufacturers of off-road rubber, so I gave them a ring to see if they could unravel some of the mystery that surrounds tires. I talked to Tim Clark, Pro-Line's tire engineer, and here's what he had to say:

"We developed the original 'mini-pin' tire design in the winter of '90 in an attempt to gain extra traction on very hard surfaces," says Tim. "The problem with conventional tire designs—those that used larger spikes—was that they relied on surface penetration for traction. We wanted to develop a tire that created friction when used on hard surfaces." Pro-Line's original mini-pin tires definitely proved Tim's theory correct: at the '91 Florida Winter Champs, they were used to finish first and second in the 2WD Modified Class, and first, second and third in the Truck Class.

Taking this concept further, Pro-Line released its "Fuzzie" tire design almost one year later. "Basically, the Fuzzie is the mini-pin design taken a step further," adds Tim. "By combining a sharper and smaller pin design with a higher density of pins, we created a tire that actually 'scraped' the track surface for traction."

At this stage, Pro-Line engineers determined that these new tire designs would benefit from a rubber compound that would act as an adhesive agent and help the tire itself to "grip" the track. "The original XT compound was developed for 'penetrating' tires—those that required a firmer rubber that would support the larger spikes," says Tim. "The mini-pin and Fuzzie tires rely on friction, not penetration, so we set about finding a rubber compound that would increase the tire's adhesion."



Pro-Line's new XTR compound tires were very successful at the '93 Florida Winter Champs. Here's Mark Pavidis and his winning RC10T. Mark used Pro-Line's Pro-90 XTR tires to win all three A-Mains in the Truck Class. Pro-Line tires were also used to win the 2WD Modified and 4WD Modified Classes in Florida.

The result was Pro-Line's incredibly soft, new XTR compound, which, according to Tim, when combined with the mini-pin or Fuzzie tire design, provides unbelievable amounts of traction on hard dirt or clay tracks.

Tim usually recommends foam inserts when XTR compound tires are used. The foam allows your car to make full use of the compound's "stickiness," and it also reduces sidewall flexing and allows the tire to handle more consistently, especially when the car hits large bumps or when it corners hard.

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Florida Winter Champs

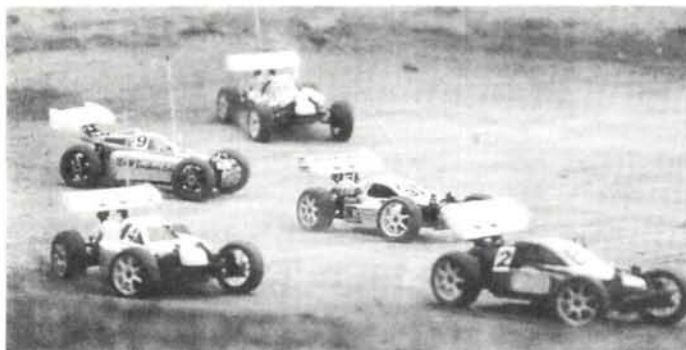


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Track Directory



First report: Southeast Gas Challenge



Unfortunately, the race was plagued with less than desirable weather throughout the weekend, but when the A-mains started, **Kris Moore** grabbed the holeshot in the buggy class, while **Jack Johnson** took an early lead with his truck. Did they win? Guess you'll have to wait until next month to find out!

In this month's episode of "As the Gas World Turns," we took a short jaunt down to Atlanta, GA, for the annual **Kyosho/Car Action Southeast Gas Challenge**. Factory racers from Teams **Kyosho**, **Mugen** and **Pirate** battled for supremacy in the 1/8-scale division. Leading the pack was **Matt Ledger** of Team Mugen; he turned in a top-qualifying run of 21 laps in 7:06.78 minutes. Following Matt was **Kris Moore**, with 21 laps in 7:11.76 minutes.

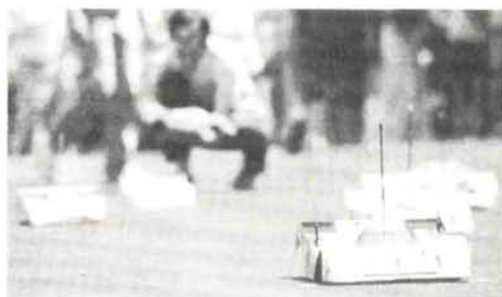
Teams **DuraTrax**, **Composite Craft**, and **A-Main/Dudgeon Racing** vied for top honors in the 1/10-scale gas truck class. TQ was none other than Team Losi's **Jack Johnson**, with a prototype truck, burning 14 laps in 5:13.12. Right behind Jack was his teammate **Mike Weed**, with 14 laps in 5:13.69.

Point Blank—the race

Roadcourse racers on the East Coast are gonna love this bit of news: **Point Blank** is holding an on-road event for 1/10- and 1/12-scale electric cars on August 7 and 8 at the **American Hobbies Raceway** in Englishtown, NJ.

American's super-smooth outdoor circuit is one of the finest in the region, so come on out and give it a try. To keep the competition fair, all motors will be handouts from Point Blank, and **ROAR rules apply** (you must be a ROAR member to participate—membership will be available at the track).

For more information, contact American Hobbies, 142 Wilson Ave., Englishtown, NJ 07724; (908) 446-2010.



New England Off-Road Points Series

If you're into off-road, and you're going to be in the Connecticut/Massachusetts area this summer, then you'll want to check out the **New England Off-Road Point Series**. Though Race One of the series is already history (it took place on May 16 at the R/C Madness track in Enfield, CT), you can still catch the rest of the series. Here are the dates and facilities:

Race Two—June 27 at **C&C Hobby and Raceway**, 562 Russels Mills Rd., S. Dartmouth, MA 02748; (508) 997-4131.

Race Three—July 11 at **Fastrack Raceway**, 19 W. Townsend Rd., Lunenburg, MA 01462; (508) 597-3344.

Race Four—August 7 at **K&N Speedway**, West St., Stafford Springs, CT 06076; (203) 684-9896.

Race Five—September 26 at **Megadrome Raceway**, N. Adams Plaza, Rte. 8, N. Adams MA, 01247; (413) 445-4777.

Classes include 2WD Stock, 2WD Modified, Truck Stock, Truck Mod, and 1/10-scale Gas Truck. ROAR rules apply, and large trophies will be awarded for the top five point-series finishers. Call the tracks for additional information.



Attention oval freaks! The fabulous **PC Hobbies Raceway**, in King, NC, will host its **Second Annual Cam Challenge** on August 20, 21 and 22.

Classes include 4-minute **Stock** and **Modified**, the **World Pit Crew Race** and, of course, the **Cam**

Challenge—the absolutely grueling, 1,200-lap **Enduro** that will truly test the mettle of both driver and machine. This year, we at **Car Action** are proud to announce our co-sponsorship of the event; it's sure to be a blast, so make your plans now. By the way, the Cam Challenge will be **PROCAR-sanctioned**.

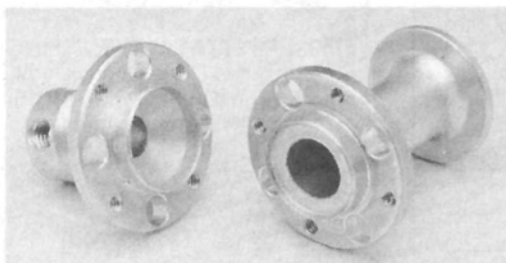
Entry fees for the race are: **\$45** for **Stock** and **Enduro**, **\$35** for **Modified**, and **\$5** for the **Pit Crew Race**. To receive an entry form, or if you have any questions regarding the event, call PC Hobbies at (919) 983-5156. The address is PC Hobbies, 143 Industrial Dr., King, NC 27021.



Cam/Car Action challenge



SPEED SHOP



VANTAGE ENGINEERING

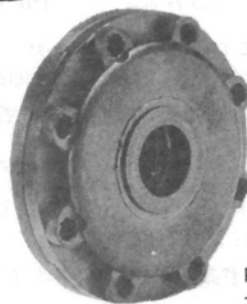
Stronglite Magnesium Hubs

Weight is an enemy of high-performance super-speedway cars, especially when it's a large part of the car's rotating mass. These hubs greatly reduce the rotating mass of your rear-axle assembly, and they maintain the strength you expect from your stock hubs. Vantage hubs are made of AZ31B-F—the highest grade of magnesium available—and they're available in pairs or separately, setscrew or clamp-type.

Part no. SH100S

Price: \$44.95/pair

Vantage Engineering, 681 Main St., Waltham, MA 02154; (617) 894-8694.



TEAM LOSI

Hydra Drive Housing Set

The complete housing assembly for the acclaimed Hydra Drive unit is now available separately. If you strip the threads in the housing, it's now easier and more cost-effective to rebuild the Hydra Drive unit.

Part no. A-3119

Price: \$14.95

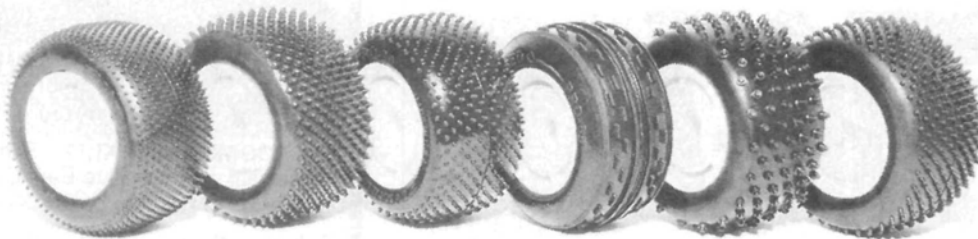
Team Losi Inc., 13848 Magnolia Ave., Chino, CA 91710; (909) 465-9400.

DYNAMITE

McCoy MC9 Power Plug

Stress, heat, oxidation and corrosion can distort and ruin most glow plugs. This power plug, however, builds on a heavy-gauge, pure-platinum element that's virtually impervious to these detrimental forces. The element is securely welded so you won't have to worry about it becoming loose. A ceramic insulator seal prevents any compression leakage that might rob your engine of power. Its threads are slightly tapered for a better seal. This plug was used to win nearly every major gas event held in the U.S. in the last two seasons, including the U.S. Nationals, Off-Road World Challenge, McCoy, Vegas, West Coast Challenge and many others. There are two plugs per package.

Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.



PRO-LINE

XT & XTR Compound Series

This rubber compound provides the ground-control performance that made our Race Engineered Design

(RED) tire series famous at the track. RED's XT compound was designed to run in many racing conditions on both clay and dirt; it dominates on harder racing conditions. The XTR tread designs cover a wide spectrum of track conditions, from loose, high-bite to hard-packed.

Part nos.—new 2.2-inch truck tires in XTR: 8092 (Fuzzie T ultra mini-pin rear); 8130 (Traction Plus step spike rear); 8090 (original mini-pin design rear); 8065 (multi-ribbed with staggered mini-bars front); 8150 (step-spike rear); 8120 (coarse-spike rear).

Pro-Line USA, P.O. Box 456, Beaumont, CA 92223; (909) 849-9781

TRINITY

Pro Racer Silicone Shock Oil



Unlike regular shock oils, the weight of Trinity's Pro Racer Oil doesn't change with the temperature, so your shock setup doesn't change. It's available in 10WT through 70WT and in half weights, so you can fine-tune your suspension. It's available separately, or in five-bottle, on- or off-road packages. A bulk package that includes five bottles of each weight is also available.

Part nos.: RC76-10, -15, -20, -25, -30, -35, -40, -45, -50, -55, -60, -70 (last two digits indicate weight); RC76-71 (on-road package); RC76-72 (off-road package); RC76-73 (bulk).

Prices: \$2.99; \$13.95 (on- or off-road package); \$155.

Trinity Products, Inc., 1901 E. Linden Ave. #8, Linden, NJ 07036; (908) 862-1705.



ROYAL PRODUCTS

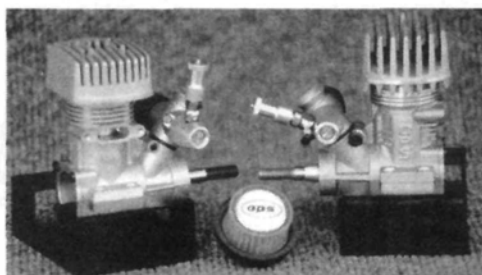
AC/DC Chargers

These new chargers have ergonomic case designs that make meter viewing easier and improve cooling: model 1000—automatic charging, no meter; model 1005—non-variable charge rate, meter; model 1010—adjustable charge rate, meter. They all use a high-output, low-operating-temperature transformer that minimizes heat build-up.

Part nos.: 1000; 1005; 1010.

Prices: \$35.95; \$44.95; \$50.95.

Royal Products Corp., 790 W. Tennessee Ave., Denver, CO 80223; (303) 778-7711.



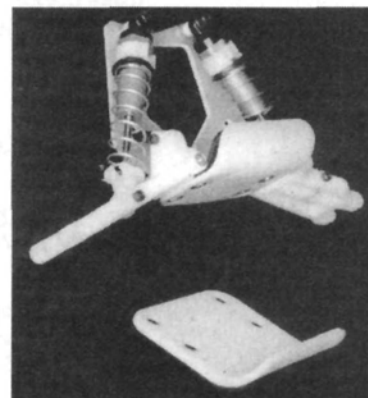
OPS MOTORI OF ITALY

R/C Car Racing Engines

This complete line of engines ranges in size from .15 to the popular 3.5 model. OPS has been producing model racing

engines for 27 years. They're now available through Shamrock Competition Imports.

Shamrock Competition Imports, P.O. Box 26247, New Orleans, LA 70186; (504) 242-5967.



RPM

RC10T Mini Bumper/Skid Plate

This small, compact, dyeable bumper also acts a skid plate and is wide enough to protect the leading edge of the arm at the E-clips. The front of the bumper rolls up just in front of the chassis to absorb most of the impact. It works great on RPM's "Worlds" front-end kit.

Part no.—7071; price—\$3.95

RPM, 14978 Sierra Bonita Ln., Chino, CA 91710; (909) 393-0366

TEAM ASSOCIATED

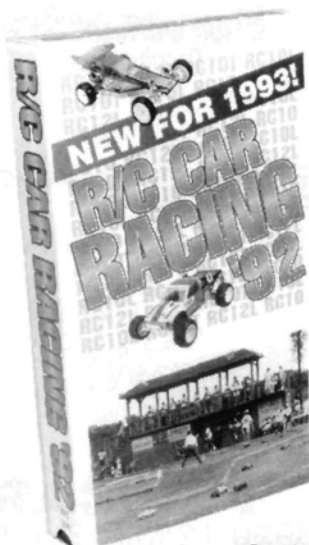
R/C Car Racing '92 Video

This 2-hour video is packed with races that display the world-class driving talents of the best R/C car racers in the most exciting races of '92—IFMAR 1/12- and 1/10-Scale On-Road World Championships, Reedy Race of Champions, Thunderdrome, ROAR's 1/10-Scale Off-Road Nationals, 1/8-Scale Gas Nationals, and 1/10-Scale Truck Nats. Learn the winning speed secrets of world champions Cliff Lett and Masami Hirosaka, JD Beckwith, Brian Kinwald and Mark Pavidis. It's the next best thing to being there!

Part nos.: 6974 (VHS); 6974P (PAL).

Price: \$19.95

Associated Electrics Inc., 3585 Cadillac Ave., Costa Mesa, CA 92626; (714) 850-9342.



Descriptions of the products shown on these pages were derived from press releases supplied by manufacturers and/or their advertising agencies. The information given is neither an endorsement of the product by *Radio Control Car Action*, nor a guarantee of performance or safety. If you write to the manufacturer about any product described here, be sure to say that you read about it in *Radio Control Car Action*.

KYOSHO WILLIAMS RENAULT

(Continued from page 34)

that's right, I used the same battery pack all day. As long as you discharge these batteries and let them cool to room temperature, you'll see no drop in performance—very economical!) When the car was back up to speed, I realized how powerful this motor was; it was ballistic!

The soft, green-compound tires provided optimum traction, and I liked how straight the car tracked as I went back and forth over the asphalt. Steering was tight and quick, thanks to the Futaba servo. To adjust the rear suspension sensitivity, just turn the rear screw of the T-plate; this will switch the handling from oversteer to understeer—whichever suits your driving style. As I drove the Williams, I realized how much fun it is to just drive an R/C car; no pressures of tire selection, diff settings, or lap times—just good, non-stressful fun. Not that I'd ever give up racing, mind you!

Overall, I think that the Williams-Renault is an excellent entry-level vehicle; the instructions are easy to follow, it's easy to build, and it's a great bargain. I think Kyosho is on to something here. If you're just starting in R/C, or you're looking for something new, go out and pick one up; you won't be disappointed. Have fun!

*Here are the addresses of the companies mentioned in this article:

Kyosho/Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826.

Kimbrough Products, 1420 East St. Andrews Pl., Unit F, Santa Ana, CA 92705.

Trinity Products Inc., 1901 E. Linden Ave. #8, Linden, NJ 07036.

KO Propo; distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728.

Novak Electronics Inc., 18910 Teller Ave., Irvine, CA 92715.

Tekin Electronics, 940 Calle Negocio #140, San Clemente, CA 92673.

Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718.

Point Blank; a subsidiary of Trinity Products. ■

LETTERS

(Continued from page 9)

REMEMBERING MIKE

Our local club said a tearful goodbye today to one of our racers. He was a good kid and will be missed but not forgotten. He was only 17 and he had many interests. The boy loved to race, and he fought his leukemia with the same "never say die" vigor. He raced with us just two weeks before his death.

Mike Guimil was a dedicated reader of your magazine and was always talking about some article or another he had read. In fact, he was such an avid fan that he's taking a copy with him to the Pearly Gates. Just thought you'd like to know.

Mike, we know you'll see this, so keep the

hammer down, the dust flyin' and your motor clean. Oh... and save me a place on that drivers' stand.

STEVE STONE

Memphis Radio Control Car Club
Memphis, TN

LONG, DRAWN-OUT QUESTION NO. 45

Could you tell me the address of Custom Racing Products?

MIKE REED

Taunton, MA

Certainly; it's 8784 Plata Lane, Atascadero, CA 93422; (805) 466-6945. We love the simple requests...

LA



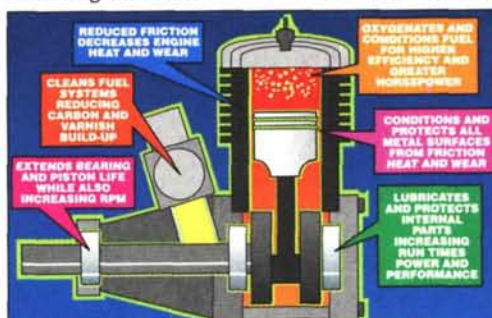


SSSSSS SECRET WEAPON!!!!!!

POWER REV

Due to the revolutionary affect new Snake Oil Lubricants' Power Rev is having on R/C engines, many modelers are making it their "Secret Weapon". Power Rev will quickly transform any R/C engine into a faster, smoother, more powerful and efficient powerplant. The special SP-10 lubricant formula in Power Rev R/C Fuel Treatment, R/C Engine Treatment, and R/C 2-Cycle Oil is the secret that effects a positive change in the surface metal of all internal engine parts. This electro-chemical conditioning causes the parts to become

repellent to each other which helps to eliminate friction. The results are phenomenal! Power Rev R/C Fuel Treatment stabilizes and oxygenates fuel for more efficient combustion, and even longer running times. And regular treatment with Power Rev R/C Engine Treatment will guard your engine from wear as it lubricates and protects all internal engine parts. The big names in R/C are using Snake Oil lubricants now and they swear by them. So if you notice a bottle of Power Rev hidden in a buddy's field box you'll know why he hasn't told you about it... that's his secret weapon!



TURNING ENGINE RED LINES GREEN



"After the increased speeds my Aggressor achieved, I use Snake Oil Lubricants to treat all my R/C equipment." --David Ribbe



LUBRICANTS

Available at R/C Outlets Nationwide
Exclusively Manufactured for and Distributed by
Robert Mfg., Inc. St. Charles, IL 708-584-7616

MADE IN USA  ©1993 ROBERT MFG.



"After 10 years of experience with ducted fan engines, nothing compares to the performance gained from using Power Rev Additives." --Dennis Crooks

• Power Rev R/C Engine Treatment - SO-01 • Power Rev R/C Fuel Treatment - SO-02 • Power Rev R/C 2-Cycle Oil - SO-06 •



BLIZZAZA BUSTERS!





by RICK SCHWARTZ

SUPERLATIVE!
In Webster's
dictionary,

it's defined: "superior to or
excelling all others; of the
highest kind, quality,
degree, etc.; supreme."

Look it up in your R/C dic-
tionary, and you'll see that the defini-
tion includes "also see Florida Winter
Champs."



PHOTOS BY WALTER SIDAS & RICK SCHWARTZ

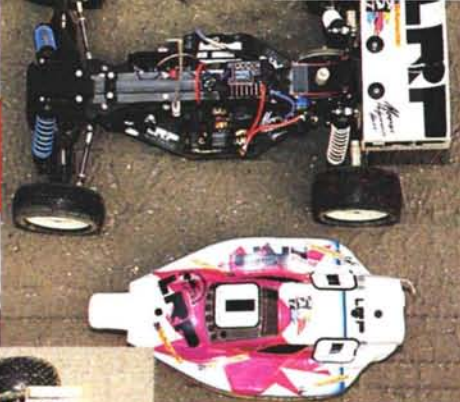


RD

Team
Losi &
West
Coast
R/C
Club
present

Florida Winter Champs





TOP 4WD FINISHER

Jurgen Lautenbach and his winning Schumacher BossCat.



STOCK-CLASS WINNER

Mike Fletcher and his winning Losi Pro SE



A-MAIN TRUCK WINNER

Mark Pavidis and his winning Associated RC10T.



2WD A-MAIN WINNER

Bad Brad Reelfs and his winning Associated RC10.

FLORIDA WINTER CHAMPS

Sponsored by Team Losi and hosted by the West Coast R/C Club of Tampa, FL, the 1993 Florida Winter Championships is truly a superlative race. It has everything an R/C racer could want: a premier track, a high level of competition, representation by all the major manufacturers and, most important, a dedicated core of club members who work their tails off to make sure things run smoothly.

The race was started by the Tampa club in 1986, and it has become one of the most important events in off-road racing.

More than 1,000 drivers applied for the 400 available slots, and teams and drivers came from far away to participate.

There were entrants from Germany, England and South America.

Even though no points are awarded and the event doesn't count toward national titles, participation and a high finish allow drivers and manufacturers well-earned bragging rights.

This year, the race was held from February 25 to 28. On Thursday, the facility was open all day for practice, and many drivers took advantage of the opportunity to fine-tune their cars.

The track was in superb shape, and the Tampa club's maintenance crews ensured that the surface was consistent throughout. On Thursday night, there were technical seminars at a local hotel; two sessions covered motors and batteries and chassis and suspension. The technical elite of R/C racing was there to answer questions and offer tips on how to improve—quickly. They included Mike Reedy (Reedy Motors and Batteries), Tyree Phillips (Novak), Mike Walker (Twister), Cliff Lett (Team Associated), Gil Losi Jr. (Team Losi), Jurgen Lautenbach (LRP/Schumacher), Tom Crowe (MPI) and many others. If they couldn't answer your question, you weren't asking the right question!

On Thursday night and Friday morning, the dreaded Florida rain came, and despite its tarp covering, the clay track was drenched. Again, the Tampa club worked miracles; qualifying was delayed for several hours, but it began on a perfect surface.

Stock-Class winners (left to right): third—Joe Kolp Jr.; first—Mike Fletcher; second—Todd Lewis. • 2WD Modified winners (left to right): third—Jon Anderson; second—Scott Hughes; first—Brad Reelfs. • 4WD Modified winners (left to right): third—Jonathan Morgan; first—Jurgen Lautenbach; second—Derek Furutani. • Modified Truck winners (left to right): third—Brian Kinwald; second—Jack Johnson; first—Mark Pavidis.



2WD STOCK

2WD MODIFIED

4WD MODIFIED

TRUCK MODIFIED

Rappin' With Pops

Team Losi has sponsored the Florida Winter Championship for three years, so, naturally, I just had to talk to the man who helps it all happen—Gil "Pops" Losi.

Rick Schwartz: Why did you initially agree to become involved with a race that's so far from your home and your business?

Gil "Pops" Losi: We started coming down here years ago when the Winter Championships were 1/8 scale. As off-road developed, they put in a race around the same time in Orlando, and we came to that. Then it moved here, and we came here. We just let the club do the job; they worked pretty hard and ran a fair race. They told me they had sponsorships that fell through and I said, "I think that you guys do a great job, and if you need somebody, we'll help you next year." And that's how it started.

Rick: You aren't involved with the running of the race?

Pops: Not a word; not a thing. As sponsor, we do get pit space, but

it isn't a lot different from anybody else's.

Rick: A lot of people see the participation and competition in this race as being on a level with the Worlds. Do you agree?

Pops: I think it's the first big race of the year—especially for people from the Northeast. It reached world-class level when the Schumacher people started coming over here. It's like the Daytona 500.

Rick: Very few other races haul in 400 people. Do you think it's successful because it gives teams a chance to show off new products?

Pops: Partly, but I think it's more like the McCoy race on an 1/8 scale. Do you remember that?

Rick: That was the 1/8-scale on-road race that eventually became more important than a national, because it was always held at the same site and it developed a tradition. This race has been run for

about seven years here, hasn't it?

Pops: As the Winter Champs. Having it at the same place every year at the same time, makes it notable—the first major race of the year.

Rick: Looking forward to the rest of the year, is it important for your products to do well here, at the first big race?

Pops: For new products, it probably is.

Rick: The Double-X transmission is making its debut here. Am I correct?

Pops: Basically. We've run it in a couple of other races, but this is the closest to production form it has been run. I'm really happy, because I think it's first in Stock, and second in Truck and Car and that's just the beginning. Not bad!

Rick: You don't have any extras you can sell, do you? Just kidding!

Pops: If we have 20 working transmissions, it doesn't mean



Here, Gil "Pops" Losi proudly displays one of his company's creations.

we can push a button and make 2,000. They aren't perfect yet; we have to adjust some of the tooling, but I hope they'll be on the market in two to three weeks.

Rick: Like the Hydra Drive, which you wanted to fine-tune before making it generally available?

Pops: It's easy to make 20, but if you make thousands, you must have quality control, so it's a little different.

Quality control. And commitment. They're what make the difference.

THANKS, POPS!

THE EVENTS

- 2WD Stock—eight heats (This came first.)
- Modified Truck—12 heats
- 2WD Modified Car—16 heats
- 4WD Modified—three heats

That's a lot of racing!

Because of the delay, the first day of qualifying ended under the lights. After 14 hours at the track, tired racers headed back to their motels at 9 p.m. to start working on their vehicles for Saturday's rounds.

On Saturday, the event really blossomed. Spectators showed up in droves, and drivers who weren't able to participate arrived to watch the racing, make their rounds of the manufacturers' tents and renew old friendships. In the pits, tires were snipped, calcu-

Overcoming Adversity

One of the most satisfying aspects of R/C racing is seeing how many families participate. Especially at bigger events, you see parents cheering on their children and the children watching their parents as they wait for their turn. R/C racing allows everyone to participate, even if they're physically impaired.

Kevin Beavers and his father, John, often compete together. Twenty-year-old Kevin is a gung-ho R/C racer who has been racing for four years in 2WD stock and modified. The only difference between Kevin and the other 400 Winter Champs racers is that Kevin is deaf, but he has always worked hard to participate in all aspects of the "hearing" world. He went to the Florida School for the Deaf in Jacksonville, and he now attends Travis Vo-Tech, where

he's learning the printing trade.

This father/son relationship is unique. While Kevin drives, John stands behind him; a tap on Kevin's shoulder lets him know when a race starts or finishes. Kevin feels he has a slight advantage over other drivers because the surrounding noise doesn't break his concentration. The only adjustment he makes is that he turn-marshalls on the outside of the track (not in the middle) so that he can see his entire area of responsibility.

Kevin hopes to progress in the sport and move up in the rankings; John will be with him all the way.



Here's Kevin Beavers and his father, John.

Probin' for Products in the Pits

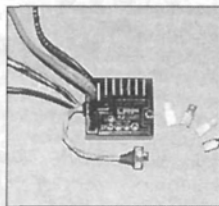
Events like the Florida Winter Championships give manufacturers a perfect opportunity to showcase their latest and greatest. Here's what I spied during my pilgrimage to the pits!

LRP gains control!

Jurgen Lautenbach proudly displayed the LE 25 AMS MK II speed controller. Three features make it unique.

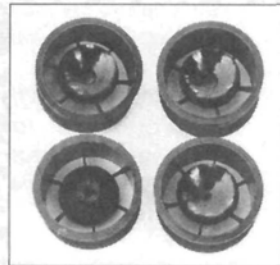
- It doesn't need heat sinks to keep it cool.
- It has an external, adjustable, braking pot.
- Its Advanced Modulation System (AMS) allows you to plug in silicon chips to obtain specific current-limitation settings. This allows maximum efficiency, faster reaction and more responsive throttle control. The secret? A 2500Hz high frequency is modulated on top of the base frequency.

To ensure consistency, this controller controls voltage levels throughout the batteries' charge. Even when the battery is flat, the ESC's resistance stays the same. There's also an optional, external, torque-limiting, 0 to 100A potentiometer.



LRP's new speed controller.

Garry Owen of Pro Series Equipment (PSE) showed some dynamite new "Vortex" wheels that are very light, but also strong and durable. They're available for the Associated RC10T and the Losi LX-T.



Parma/PSE's new Vortex wheels.

Peakin' at PSE/PARMA

Team Venezuela and Team St. Croix

The Winter Champs drew many participants from abroad. They headed to Tampa with one goal in mind—racing! If you lived in a foreign country or halfway across the U.S., would you come just to watch?—probably not, unless you're a member of the Las Fuentes R/C Club from Caracas, Venezuela.

Anibal Silva and his son, and Jose Luis Martino, his wife, Maria, and their son Jonathan heard about the race too late to enter, but they came to watch. For four days, they wandered, watched, asked questions and made new friends. It was their first U.S. race, and they were very impressed with the race organization and the drivers' skills.

Mr. Martino owns Speed Only—a hobby shop—and his team T-shirts were hot trading items. The Martino and Silva families plan to attend again next year—as racers.

Two racers traveled more than 2,000 miles from St. Croix, in the U. S. Virgin Islands. Emilio Perez (a jeweler) and Tom Jaffurs (a harbor pilot) flew to Tampa by way of San Juan, PR. They're both extremely dedicated R/C racers and members of a small group who have to buy all their R/C supplies by mail order. When they're at home, though, they *don't* have to worry about a long drive home after a race.



Members of the Las Fuentes R/C Club from Caracas, Venezuela.



Here are Emilio Perez and Tom Jaffurs of St. Croix (Virgin Islands).

lations were made to determine the best gear ratios, and drivers tried to figure out ways to get the edge. Although the racers were serious and highly competitive, the atmosphere was relaxed and friendly.

Again, the weather delayed the end of the day's racing until approximately 9 p.m., and by then, you were looking at 400 *really* tired racers.

At the motel, there were heated discussions about the merits of particular tires, batteries, motors and manufacturers as racers prepped their cars for the next day. Sleep was limited.

Early on Sunday morning, I talked to Bob Serra, president of the West Coast Club, and he seemed pleased with the way the race was going. We discussed the importance of the event's sponsor, Team Losi. Since Losi became involved three years ago, the race has really grown. By providing the necessary financial support, without demanding control over how the race is run, Losi has allowed the West Coast Club to develop a topnotch international event that was designed for racers by racers.

TENSION TIME!

On Sunday morning, the atmosphere was a little more tense. This was it! The qualifiers were over; it was time for the Mains—which Main didn't matter; everyone wanted to take home that trophy.

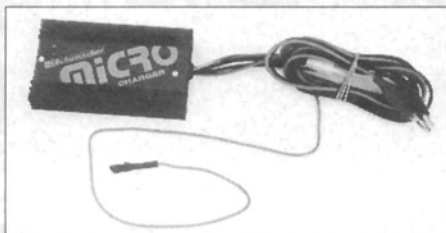
With the exception of A-Main 2WD Stock, all the other A-Mains ran three heats, one being a throw-out. This allowed the best drivers to have one bad race and still win or finish near the top.

• **2WD Stock** was decided first. Todd Lewis TQ'd with 11 laps in 4:00.720. Fewer than 5 seconds separated him from the number-10 driver, so the race was hotly contested. Lewis and third-place qualifier Mike Fletcher battled for

Sizzlin' from Schumacher

• **Micro Charger.** This small, compact, soft-pulse charger is available in two modes: Peak Detector and Thermal Detector.

The Peak Detector requires clean voltage, and the use of an in-line 4700-microfarad, 35V capacitor is recommended.



ommended. This cleans voltage from the power supply and eliminates false peaks.

The Thermal Detector takes 90 seconds to measure battery temperature, then it adds 8 degrees Celsius to that to establish the thermal cutoff level. No matter what the external temperature is, the charge will be the same, and a built-in fail-safe device ensures automatic cut-off.

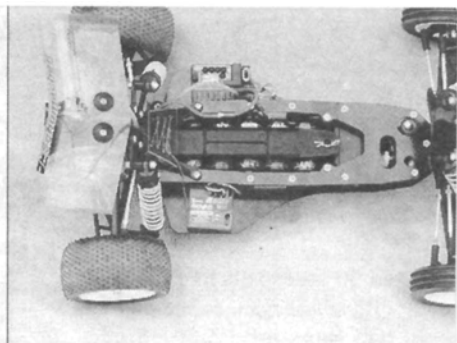
According to Schumacher VP Warren Clapp, this is state-of-the-art.

Schumacher's new Micro Charger.

• **Cougar 2000**—an all-new, hot-looking, 2WD buggy that has a gear-driven tranny and a double-deck fiberglass chassis. Almost all the components are adjustable. By inserting various plugs into the rear hub carrier and the front hub, you can adjust front-end kick-up, front caster, front and rear camber, toe-in and anti-squat.

The Cougar 2000 comes with a built-in, adjustable servo-saver. To put the power to the rear wheels, the kit has a full-race ball diff with 4mm carbide balls that offer more surface contact for a smoother, more efficient action. The drive shafts are hollow tubes made of light aluminum.

The Schumacher Cougar 2000.



most of the race, but at the finish, it was Fletcher (11 laps in 4:10.170), Lewis (11 laps in 4:10.910) and Joe Kolp Jr. (11 laps in 4:11.880).

• **Modified Truck** had TQ John Walters as the favorite with 12 laps in 4:11.880, but after the first heat, number-nine qualifier Mark Pavidis held first place. He went on to two more number-one spots to make a clean sweep of this division. The second spot went to Jack Johnson, and the third to Brian Kinwald. Considering the high level of competition, three first-place finishes was a remarkable feat. Congratulations, Mark!

• **Modified Car** provided the real drama of the day. TQ Scott Hughes had completed 12 laps in 4:14.390, and during the first race, he held on to that with a first-place finish while the seventh-place qualifier Brad Reelfs finished second.

In the second race, Brad Reelfs move up to first while Hughes took a dive to sixth, giving Reelfs a commanding lead going into the final qualifier. One race was a throw-out, so we knew that if Hughes beat Reelfs in the third race, he still could win. The last race was what R/C racing is all about. The hot battle between Hughes and Reelfs lasted the length of the race, but Reelfs took the checkered flag—and had won the class? Unfortunately not. The clock had inadvertently been start-

Over the Hill, but Still Rollin'

What do you do to ease the tension and provide comic relief for more than 400 racers who have been concentrating, tuning and competing for three days?

You take nine "old" men (over 40), give them stock trucks and have them compete in an "Over-the-Hill" race before the Mains. Believe me; it works!

I went to the Winter Champs to cover the race for *R/C Car Action*, but I took my truck along, just in case I had time to put it on the track. I was invited to participate in a Sunday-morning race in which representatives from a variety of manufacturers and other interested "seniors" would battle it out in a one-heat race, and I accepted the challenge.

When I heard names such as Reedy, Hustung and Clapp mentioned, I felt a little nervous; I actually spent Saturday night in my room tweaking my Losi LX-T truck. I wasn't prepared to race, and I didn't have all my equipment and spare parts. Fortunately, MPI's Tom Crowe gave me a great battery; Parma/PSE's Gary Owen provided me with rear wheels; and Novak's Tyree Phillips checked my T-4 ESC.

When Sunday morning rolled around, I was ready! As we climbed the stairs to the drivers' stand, I felt worthy of defending the honor of *R/C Car Action*. Then we



Here's the proud victor—Warren Clapp.

heard that—just to make things more interesting—we'd have to race the course in the *wrong* direction.

It was rumored that, last year, one "oldie" had one of his team drivers controlling his car from the stands, so we had a radio check. This was getting serious!

I really don't remember too much about the race, but I *do* know that on the third lap, my truck was crunched and lost a shock and a spring. This made it drive all over the place and

run most of the other drivers into the wall and off the track. It was fun after all!

Warren Clapp (Schumacher) took first, Gary Owen (PSE/Parma) finished second and Bob Serra, president of the sponsoring West Coast club placed third. I limped home, disappointed, in fifth and tried to avoid *R/C Car Action* editor Frank Masi for the rest of the day.

The lineup for the "Over-40" race included a few top names, such as Mike Reedy, and Schumacher's Warren Clapp.





2WD STOCK

ed 30 seconds before the race officially began, so the drivers had run only 3:30. Since ROAR rules require that a race last 4 minutes, so the heat had to be run again. Fortunately, despite his disappointment, Reelfs refused to be shaken and when the heat was run again, he won it and the overall championship. He was ecstatic! Scott Hughes finished second overall, with Jon Anderson coming in third.

• **Modified 4WD.** Jürgen Lautenbach seemed to own this one. He TQ'd with 12 laps in 4:06.450, then took two firsts and a third. Second place went to Derek Furutani, who had a first, a second and a fifth. Jonathan Morgan took third with second-, third- and seventh-place finishes.

TROPHY TIME

Under threatening skies and approaching darkness, trophy presentations started almost immediately after the last race. Bob Serra and Miss Winter Championships, Angela Simmons, distributed the awards, which included one for Gil "Pops" Losi who was honored for his race sponsorship and his many contributions to R/C racing.

It was a great three days of R/C racing. Our Tampa hosts outdid themselves and showed what can be done with proper planning and cooperation. I made a lot of new friends, met some great people and can't wait to go back next year. ■

Fin	Qual	Name	Chassis	Motor*	ESC	Radio	Batteries
1	3	Mike Fletcher	Team Losi Pro SE		Tekin 411G	Airtronics	Wolf Pack
2	1	Todd Lewis	Team Losi Pro SE	H	Tekin 411G	JR R-756	Max-Cell
3	4	Joe Kolp Jr.	Traxxas	A	Novak	KO Propo	S&K
4	10	Gary Studt	Team Losi Pro SE	N	Novak MXc	KO EX-1	Perfect Mat
5	9	Dean Karns	Team Losi Pro SE	D	Novak	KO Propo	Major Wood
6	5	David Hill	Team Losi Pro SE	O	Tekin 410K	Airtronics	n/a
7	7	Brian Dunbar	Team Losi Pro SE	U	Novak MXc	KO EX-1	Trinity
8	8	Mike Boekdrucker	Traxxas TRX-2	T	Tekin 411P	KO EX-1	Pole Position
9	2	Brian Daspit	Associated RC10		Tekin	Airtronics	Reedy
10	6	Vernon Harvell	Associated RC10		Novak HPC	Airtronics	New Wave

TRUCK MODIFIED

Fin	Qual	Name	Chassis	Motor	ESC	Radio	Batteries
1	9	Mark Pavidis	Associated RC10T	Reedy Mr. A	Novak HPC	Airtronics	Reedy
2	5	Jack Johnson	Team Losi LX-T	Trinity	Novak HPC	JR R-756	Trinity
3	7	Brian Kinwald	Associated RC10T	Reedy Mr. L	Novak HPC	Airtronics	Reedy
4	8	Vince Stolo	Team Losi LX-T	Revolution	Novak	Airtronics	Trinity
5	2	Jason Ruona	Associated RC10T	Reedy	Novak	Airtronics	Max-Cell
6	4	Gary Guest	Traxxas Blue Eagle LS	Peak 15Q	Novak HPC	Airtronics	Orion
7	6	James Ward	Traxxas Blue Eagle LS	Peak 15Q	Novak M1	Airtronics	Orion
8	3	Doug Laurent	Associated RC10T	Reedy	Novak	Airtronics	Parma
9	10	Jay Halsey	Team Losi LX-T	Trinity	Novak HPC	Airtronics	Trinity
10	1	John Walters	Traxxas Blue Eagle LS	Peak 14Q	Tekin	Futaba	Orion

2WD MODIFIED

Fin	Qual	Name	Chassis	Motor	ESC	Radio	Batteries
1	7	Brad Reelfs	Associated RC10	Reedy Mr. S	Novak HPC	Airtronics	Reedy
2	1	Scott Hughes	Associated RC10	Reedy	Novak HPC	Futaba	Reedy
3	8	Jon Anderson	Team Losi Pro SE	Trinity	Novak HPC	Airtronics	Trinity
4	10	Scott Roberts	Associated RC10	Peak 12T	Novak HPC	Airtronics	Orion
5	2	Mark Pavidis	Associated RC10	Reedy Mr. O	Novak HPC	Airtronics	Reedy
6	4	Kevin Moore	Schu. Cougar 2000	LRP	LRP	KO Esprit	LRP
7	5	Rick Vehlou	Traxxas TRX-1	Peak	Novak	Airtronics	Orion
8	9	Allan Abess	Associated RC10	Redline	Novak HPC	Airtronics	Team Smooth
9	6	Jeremy Kortz	Associated RC10	Twister	Tekin	Airtronics	Max-Cell
10	3	Rick Hohwart	Associated RC10	Peak 13D	Novak HPC	Futaba	Team Orion

4WD MODIFIED

Fin	Qual	Name	Chassis	Motor	ESC	Radio	Batteries
1	1	Jürgen Lautenbach	Schu. BossCat Works	LRP Magic	LRP	KO EX-1	LRP
2	3	Derek Furutani	Beckwith Yokomo	LRP	LRP	Airtronics	LRP
3	5	Jonathan Morgan	Schu. BossCat	Reedy	Novak MXc	Airtronics	Reedy
4	5	Werner Bergbauer	Kyosho Lazer	Evolution	HEL Turbo	KO EX-1	Mega
5	6	Scott Roberts	Yokomo Works	Peak	Novak HPC	Airtronics	Orion
6	10	Richard Bettaney	Schu. BossCat	LRP	LRP	KO	LRP
7	2	Kris Moore	Kyosho Lazer	Twister	Novak	KO	Max Cell
8	7	Frosty St. Clair	Schu. BossCat	Reedy	Novak HPC	Airtronics	Reedy
9	8	Daniel Schimmer	Kyosho Lazer ZX-R	Evolution	HEL	Graupner	HEL
10	9	Andy Shaw	Schumacher	Tanaplan	LRP	KO	Gale Force

*Handout motor: Team Losi Super Insane Stock

The Family that Plays Together Stays Together

J.R. Mitch happens to be one of the fastest R/C racers around—fifth in the '91 Winter Champs A-Main, second in Stock at the '92 Winter Champs, and seventh in the '92 ROAR Truck Nats Stock Class.

Initially sponsored by Traxxas, J.R. has been racing with Team Losi for the past two years. (His other sponsors include Novak, Redline Motors and Team Smooth batteries.) But wait! Let's look behind the

scenes to see how J.R. reached his present level....

It all started when he was five years old. His grandmother bought him a Tamiya Grasshopper, and his father, Ken, assembled the car and started to run it in parking lots. Right away, J.R. showed a natural driving talent, and he soon worked his way through other entry-level cars.

One day, Ken and J.R. passed an indoor track in Oldsmar, FL

Team Losi Florida Winter Champs

Charger	Body	Tires (f/r)
Tekin	Jammin	Losi HT rib/4-row
Class	Losi	Losi HT rib/Jammin step pin
Tekin	Traxxas	Losi HT rib/4-row
Tekin	Losi	Losi HT rib/Jammin mini pin
Tekin	Losi	Losi HT rib/Jammin mini pin
Comp. Elec.	Jammin	Losi
Tekin	Losi	Losi HT rib/Jammin mini pin
Tekin	Traxxas	Losi HT rib/Pro-Line 8022
Tekin	RCPS	Losi HT rib/Pro-Line 8080
Comp. Elec.	RCPS	Losi HT rib/Schu. mini spike

Sponsors

Team Losi, Precision Motorworks, Jammin, Tekin, Wolf Pack Racing, Airtronics, Lunsford, Dirt Bagz
 Team Losi, Max Cell, Class, JR Radios, GPA
 Twister, Traxxas, R/C World of IN, Dennis' Concessions
 Perfect Match, Quarter Flash, Robinson Racing, R/C World of IN, Dennis' Concessions
 Team Socket, Parma, Major Woody's
 Tekin, Losi, Trik Custom Components, Bad Boyz, Lunsford, Quantum, Performance Hobbies, Competition Electronics
 Team Losi, Trinity
 Traxxas, Peak Performance, Pole Position
 Associated, Reedy, Tekin, Loupe's R/C
 New Wave

Charger	Body	Tires (f/r)
Novak	Associated	Pro-Line 90 XTR
Novak	Losi	Losi HT rib/mini pin
Novak	Associated	Pro-Line
Novak	Losi	Losi HT rib/mini pin
Novak	Associated	Pro-Line 65/90
Victor	Traxxas	Pro-Line 65/Losi 10-row
Wilson	Traxxas	Pro-Line 7065/Losi mini pin
Novak	Associated	Pro-Line 8065/8090
Novak	Jammin	Losi HT rib/Jammin step pin
Comp. Elec.	Traxxas	Pro-Line/Losi

Sponsors

Associated, Reedy, Novak, Pro-Line, Airtronics, RCPS, HPI, Kimbrough, Oakley
 Team Losi, Trinity, Novak, JR Radios, Tecnacraft, Dirt Bagz, Oakley, Jammin Products, Peugeot's House of Pain
 Associated, Reedy, Novak, Airtronics, Yokomo, Pro-Line, Kimbrough, RCPS, HPI
 Team Losi, Revolution Motors, Novak, MIP, Trinity, Tomy, Dirt Bagz, Dean's Ground to Air Hobbies, Team Air
 Associated, Reedy, Airtronics, Pro-Line, RCPS, MIP, Redline
 Traxxas, Peak Performance, Team Orion, Wolfpack, Kimbrough, MIP, Team DJ
 Traxxas, Peak Performance, Lunsford, Griffin, MIP, Wilson Systems, PAW Racing
 Parma, Associated, Magnum, Redline
 Team Losi, Trinity, Novak, Jammin, Airtronics, Dirt Bagz, Loupe's Paint, Oakley
 Traxxas, Peak Performance, Team Orion, HPI, Lunsford, Competition Electronics

Charger	Body	Tires (f/r)
Novak	RCPS	Losi HT rib/Pro-Line 8083
Novak	RCPS	Losi HT rib/Pro-Line fuzzie
Novak	Jammin	Losi HT rib/4-row
Novak	RCPS	Losi/Pro-Line
Novak	RCPS	Losi HT rib/Pro-Line fuzzie
Schumacher	Schumacher	Losi HT rib/Pro-Line 8022
Novak	Traxxas	Losi/Pro-Line
Novak	RCPS	Losi HT rib/Pro-Line XTR
Tekin	RCPS	Losi HT rib/step pin
Novak	RCPS	Losi HT rib/Pro-Line

Sponsors

Associated, Reedy, Pro-Line, Novak, RCPS
 Associated, Reedy, Novak, Pro-Line, RCPS, Lunsford, M-n-M Hobbies, Yokomo, Futaba
 Team Losi, Trinity, Novak, Jammin Products, Airtronics, Tecnacraft
 Peak Performance, Associated, Orion, Novak, MIP, RCPS, Kimbrough, HPI
 Associated, Reedy, Novak, Pro-Line, Airtronics, RCPS, HPI, Kimbrough, Oakley
 Schumacher, LRP, KO, Moore's Performance House
 Traxxas, Peak Performance, Team Orion, Novak, Airtronics, Lunsford, Pro-Line, RCPS
 Redline, Team Smooth
 Twister, Associated, Tekin, RCPS, Pro/Motion, Rob Robinson
 Peak Performance, Team Orion, Associated, Novak, Futaba, RCPS, Kimbrough, Pro-Line

Charger	Body	Tires (f/r)
Schumacher	Schumacher	Pro-Line 8082
Novak	Yokomo	Pro-Line fuzzie/80's
Comp. Elec.	Schumacher	Kyosho fuzzie
HEL	Lazer	Pro-Line fuzzie
Novak	Yokomo	Pro-Line
Schumacher	Schumacher	Schumacher micro spikes
Novak	Lazer	Pro-Line 83
Comp. Elec.	Schumacher	Kyosho
HEL	Lazer	Pro-Line fuzzie
Challenger	BossCat	Kyosho micro blocks

Sponsors

LRP Electronics, Schumacher, KO Propo, MPH
 LRP, Yokomo, Associated, MIP, HPI, Kimbrough, Pro-Line, So. Cal R/C Raceway, RCPS, Lunsford, MPH
 Associated, Reedy, Schumacher, Novak, Pro-Line, RCPS
 Kyosho, GM Racing, HEL
 Peak Performance, Associated, Orion, Novak, MIP, RCPS, Kimbrough, HPI
 Schumacher, LRP, Moore's Performance House, Ramjet Racing
 Twister, Kyosho, Novak, Max-Cell, MIP
 Reedy, Associated, Schumacher, Competition Electronics, Pro-Line, RCPS
 Kyosho Deutschland, HEL, GM Racing
 Schumacher, LRP, Tanaplan, MPH, Gale Force

ather!

The future world champ? J.R. Mitch with his proud parents.

(owned by Bill Hock). They stopped and were bitten by the racing bug. J.R. raced an RC10 in the beginners' class, and he has been racing ever since. Later, they discovered Lake Park Raceway in Tampa, and Don Hill of Lakeside Hobbies gave them a lot of helpful racing advice.

J.R. plans to attend more races with his father, and he also hopes to attend the Worlds one day. Ken says it seems as if fathers and sons

have less contact now because of the economy. Parents need to work hard to make ends meet. By sharing a hobby, he's sure to spend a lot of time with his son on weekends.



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ALABAMA

Berry R/C Raceway, Main St., Berry, AL 35543; Ronny, Don, (205) 932-3189



Dixie R/C Speedway, Rt. 10, Box 210, Gadsden, AL 35901; Craig Reynolds, (205) 442-1059



Fleming's R/C Raceway, 169 Raceway Dr., Wellington, AL 36279; Phil Fleming, (205) 820-6269



Oak Mountain Raceway & R/C Club, 2624 Janice Circle, Birmingham, AL 35235; Will Barrett, (205) 856-7051



Performance R/C Hobby, 2600 A Beltline Rd., Decatur, AL 35603; Ray & Debra Steen, (205) 353-3399



Phenix Raceway, 2006 Opelika Rd., Phenix City, AL 36867; Casey Hoover, (205) 297-0040



Piedmont R/C Superspeedway, 41 Jewel Lane, Oxford, AL 36823; Terry Young or Greg Gaines, (205) 831-2986 or 831-1666



R/C Hi-Tech Raceway, 3303 Meridian St., Huntsville, AL 35811; Rick Chambers, (205) 539-1347



Satellite Hobbies, 2799 Rose Rd., Albertville, AL 35950; Troy or Jerry Smith, (205) 878-2526



Spring Cove Speedway, Rt. 1, Box 95, Florence, AL 35630; Chuck or Lyda Sybolt, (205) 757-5998



ALASKA

ARCORR, 2812 Spenard Rd., Anchorage, AK 99503; Jim Raffuse, (907) 277-7778



McKinley Hobby & Raceway, 2300 McKinley Dr., Wasilla, AK 99654; (907) 376-9351



Seth's Speedways, 3400 Hiland Dr., Anchorage, AK 99504; Seth Graham, (907) 337-3777



Southtown Hobby & Raceway, 12001 Industry Way #2, Anchorage, AK 99515; Bob or Vickie Peters, (907) 345-3131



ARIZONA

Economy One-Stop Raceway, 4000 S. 4 Ave., Yuma, AZ 85366; (602) 344-3514



Finish Line Raceway, 7025 E. 21st St., Tucson, AZ 85710; Jerry Kikkert, (602) 747-3633



G&S Raceway, 967 Hancock, Bullhead City, AZ 86442; Bob Olsen, (602) 758-1100



Havasu R/C Raceway, 1081 Desert View Dr., Lake Havasu City, AZ 86403; Bernie Coates, (602) 680-6304



HobbyTown Raceway, 9180 E. Indian Bend Rd., Scottsdale, AZ 85250; Dennis, (602) 948-3946



HobbyTown Raceway, 1915 East Baseline Rd., Gilbert, AZ 95234; Kenny, (602) 892-0405



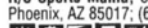
Outlaw Raceway, 5309 Lakewood Rd., Ft. Mohave, AZ 86427; Frank Greely, (602) 768-5001



R/C Raceplex, 5222 W. Glendale Ave., Glendale, AZ 85301; Bill Murray, (602) 934-5567



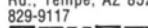
R/C Sports Mania, 3550 N. 35th Ave., Phoenix, AZ 85017; (602) 996-4668



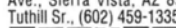
Race Prep Raceway, 852 S. Hwy. 89, Chino Valley, AZ 86323; Mike Dunn, (602) 636-1955



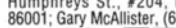
Scale Racing Sports, 1120 N. Hayden Rd., Tempe, AZ 85281; Mike, (602) 829-9117



Sierra Vista Raceway, 105 N. Central Ave., Sierra Vista, AZ 85635; Wayne Tuthill Sr., (602) 459-1335



Speedway Hobbies, 1000 N. Humphreys St., #204, Flagstaff, AZ 86001; Gary McAllister, (602) 556-0710



ARKANSAS

AERCC, Vimy Ridge Rd., Little Rock, AR; (501) 945-7037



Arkansas Int'l. Superspeedway, P.O. Box 1636, Pine Bluff, AR 71613; Joe Pitts, (501) 247-2371



DCA Racing, 412 Hiway & 14th St., Paragould, AR 72450; Lyle Spillman, (501) 236-9706



Ozark Hobby Shop, 702 S. 2nd, Rogers, AR 72756; Joe Talariski, (501) 631-6871



Performance Hobbies, 2222 Spence, Jonesboro, AR 72401; (Rick) Winningham, (501) 935-6501



Tri-State R/C Speedway, 3112 Cavanaugh Rd., Fort Smith, AR 72903; Village R/C Hobbies, (501) 646-3701



CALIFORNIA

Appletree Raceway, 1303 Hermosa Ave., Pacifica, CA 94044; Sonny Day, (415) 359-9755



ARO Hobbies Raceway, 24275 Sunnymead, Moreno Valley, CA 92553; George or Mike Kileen, (714) 924-3240



Art & Dean Raceway, 29409 Haguest, Lake Elsinore, CA 92530; Art, (714) 245-0920



Bob & Jim's R/C World, 3485 University Ave., Riverside, CA 92501; Bob Parcel, (714) 684-6314



Brake-a-Way Raceway, 3179 Hamner Ave., Norco, CA 91760; Debbie Burrie, (714) 736-6063



California Auto Racers (CAR), 96 San Tomas Aquino Rd., Campbell, CA 95008; Club Message Line, (415) 508-9971



Cats West Raceway, 5631 Old Lonetree Way, Antioch, CA 94509; Jerry Winkelbaver, (510) 779-0505



City Speedway, 7750 Convoy Ct., San Diego, CA 92111; (619) 560-9633



Cloverdale R/C Raceway, 1 Citrus Fair Dr., Cloverdale, CA 95425; Tom Kelley, (707) 586-9789



Covina Racing Company, 1611 W. San Bernardino Rd., Covina, CA 91722; Tom, (818) 331-4984



Cycle Art Raceway, 2211 N. Pleasant Way, Fresno, CA 93705; Richard De Benedictis, (209) 233-3665



D&D Raceway, 290 S. First St., Turlock, CA 95380; Dave Miller, (209) 667-0970



Desert R/C Raceway, 9231 E. Hobson Way, Blythe, CA 92225; Rodney Lazenby, (619) 922-5516



Drag City, 1361 W. Valley Blvd., Colton, CA 92324; Chris Gabriel, (714) 370-0580



Fast Eddie's R/C Raceway, 3261 Edward Ave., Santa Clara, CA 95054; Eddie Aflague, (408) 986-8256



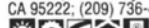
Fast Lane, 25845 San Fernando Rd., #21, Saugus, CA 91350; (805) 255-2404



The Finest R/C Off-Road Circuit, 8711 Elder Creek Rd., Sacramento, CA 95820; Jason, (916) 381-6555



Frogtown R/C Raceway, Motherlode Hobbies, 3069 Hwy. 49, Angels Camp, CA 95222; (209) 736-4989



Gina's R/C Palace, 1839 Olympus Loop Dr., Vista, CA 92083; Gina Garner, (619) 598-8069



Greater Los Angeles R/C Racing Club, California State University, Parking Lot A, Los Angeles, CA 90045; Glenn Williams, (213) 734-7888 or Tom Wong, (310) 821-5472



Hayes Raceway, 628 Walnut Ave., Patterson, CA 95363; Andy Hayes, (204) 892-5080



Hobbycrafters Raceway, 323 Five Cities Dr., Pismo Beach, CA 93449; (805) 773-6765



Hobby Haven Raceway, 3983 First St., Livermore, CA 94550; Tom Welding Jr., (510) 443-5828



Hobbytown Raceway, 1330 Keystone Way, Vista, CA 92083; Bryan Bahlmann, (599-0456)



Hobby Warehouse, 5500 So. Watt, Sacramento, CA 95828; Roger Hubbard, (916) 381-7587



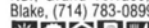
Jackman's R/C Raceway, 1616 N. Beale Rd., Marysville, CA 95901; Bonnie or Harry Jackman, (916) 741-3744



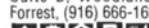
JD Hobbies, 1009 W. College Ave., Santa Rosa, CA 95401; Mike, (707) 571-1700



K&M R/C Raceway, 22474 A Barton Rd., Grand Terrace, CA 92324; Mike Blake, (714) 783-0899



The Land of R/C, 2717 Gerber Road, Suite B, Woodland, CA 95695; Le Forrest, (916) 666-1699



Lindsey's R/C Raceway, P.O. Box 443, Doyle, CA 96109; (916) 827-2457



Lucerne Valley Raceway, 32800 #4 Old Woman Springs, Lucerne Valley, CA 92356; Frank Rodrigue, (619) 248-7305



M.B. Raceway, 1031 Fremont, Alhambra, CA 91801; Tony or Dave, (818) 284-4198



Merced R/C Auto Racers (MRCAR), 1652 W. North Bearcreek Dr., Merced, CA 95348; Ed Lopez, (209) 725-8040



MnM Hobbies, 137 N. Vander, Corona, CA 91720; Don Hughes, (909) 272-3545



One-Stop Raceway, 3782 Cerritos Ave., Los Alamitos, CA 90720; (213) 493-7597



Outlaw R/C Hobbies, 7920 Webster, Highland, CA 92346; Rick James, (909) 864-1770



Paso Robles R/C, P.O. Box 3795 (3980 Linne Rd.), Paso Robles, CA 93447; (805) 237-0624



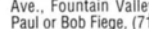
Pegasus Raceway, 14643 Hawthorne Ave., Fontana, CA 92336; Ern Dog, Bob Cat, (909) 822-0226



Perris Recreation R/C Track, 120 N. Perris Blvd., Perris, CA 92370; Len or Fay Shirley, (714) 943-6603 or 657-4879



R/C Off-Road Raceway, 10810 Talbert Ave., Fountain Valley, CA 92708; Jeff Paul or Bob Fiege, (714) 965-9615



R/C Speedway and Hobbys, 1453 North Milpitas Blvd., Milpitas, CA 95035; Mike Melai, (408) 263-4228



R/C Racing Center, 9842 Channel Rd., Lakeside, CA 92040; Russ or Cindy, (619) 443-2270



R/C Sports, 759 E. Monte Vista Ave., Vacaville, CA 95688; (707) 446-5555



Track Directory

Sacramento Mini-Wheels Raceway, 8711 Elder Creek Rd., Sacramento, CA 95828, Paul Schiager, (916) 383-4011



San Diego R/C Car Club, P.O. Box 232456, San Diego, CA 92193, (619) 560-0089



Scott's Practice Track, 1131 Ramona Dr., Mt. Shasta, CA 96067, Scott Cleveland, (916) 926-1012



So. Cal R/C Raceway, 11930 Valley View St., Garden Grove, CA 92645, Jim Blauvelt, (714) 892-0088



Square Roundhouse R/C Speedway, 1468 Lander Ave., Turlock, CA 95380, (209) 668-4454



SRS Raceway, 915 N. Main St., Salinas, CA 93906, (408) 424-4044



Tanforan Action Track, Tanforan Shopping Center, San Bruno, CA 94066, Jerry Imboden, (415) 583-2683



Team Air Racing Club, 18208 Imperial Hwy., Yorba Linda, CA 92686, Don or Nicky, (714) 579-7488



Tyler's R/C/RD Racing Center, 6865 Flanders Rd., San Diego, CA 92121, (619) 597-3072



Valley R/C Race Park, 146 S. Santa Fe St., Hemet, CA 92344, Valley Wide Recreation, (714) 654-1505 or 658-4322



Ventura Road Runners/Freedom Park Raceway, 520 Freedom Park, Canaanville, CA 93010, Les Abramson, (805) 484-8920 or Ed Haney, (805) 499-8266



Victory Speedway, 22960 Victory Blvd., Woodland Hills, CA 91367, Bob Sarnelle, (818) 888-9000



White Mountain R/C Raceway, 174 West Lane, Bishop, CA 93514, (619) 872-1599



Zero'n'4 Hobbies, 3360 S. Fairway, Visalia, CA 93277, Eddie McKay, (209) 733-1840



COLORADO

Colorado R/C Speedway, 6520 Wadsworth Blvd., #130, Arvada, CO 80003, (303) 425-1718



MDOR R/C Raceway, 15540 E. Batavia Dr., Aurora, CO 80011, Jess Brockman, (303) 343-0151



Miracle R/C Speedway, 4206 Wadsworth Blvd., Wheatridge, CO 80034, Rob Grossman, (303) 420-3051



R/C Mini Sports, 6401 Broadway, Unit G, Denver, CO 80223, John Weins, (303) 426-0110



R/C World & Track, 2788 S. Federal Blvd., Denver, CO 80236, (303) 789-0838



Rocky Mountain R/C Raceway, 5737 Constitution Ave., Colorado Springs, CO 80915, Lee Seigel, (719) 550-1777



CONNECTICUT

Craftech Raceway, Navsubase Mlon Box 14, Bldg. 460, Groton, CT 06349, Dave or Tony, (203) 449-3217



CT R/C Off-Roaders, behind Old Field School, Fairfield, CT 06455, Howie Jackson, (203) 866-5987



High-Tech Raceway, 375 Enfield St., Enfield, CT 06082, (203) 745-8488



Hobby World Raceways, 161-6 Woodford Ave., Plainville, CT 06062, (203) 793-1111



JP's Hobbies & Track, 54 Wakelee St., Ext. Seymour, CT 06483, (800) 547-5772



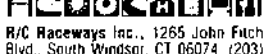
K/H R/C Speedway Inc., West St., Stafford Springs, CT 06376, (203) 684-9896



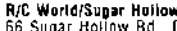
MERCAR, 36 Glendale Rd., Enfield, CT 06082, Phil Otsson, (203) 627-5410



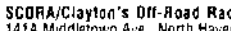
R/C Madness, 64C Enfield St., P.O. Box 64, Enfield, CT 06082, Christopher Marcy, (203) 741-6501



R/C Raceways Inc., 1265 John Fitch Blvd., South Windsor, CT 06074, (203) 528-3661



R/C World/Sugar Hollow Speedway, 56 Sugar Hollow Rd., Danbury, CT 06810, (203) 748-2185



SCORCA/Clayton's Off-Road Racing, 141A Middletown Ave., North Haven, CT 06473, Craig or Keith, (203) 234-CLAY



Wallingford Indoor Racing, 63 N. Cherry St., Wallingford, CT 06492, (203) 265-3939



DELAWARE

Hobby Works Raceway, Hamlet Shopping Center, Dover, DE 19901, Steve or Gordon, (302) 674-9123



Kennedy's East Coast Speedway, 3118 West Dupont Hwy., Millsboro, DE 19966, Russ Kennedy, (302) 934-1708



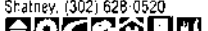
Mills Raceway, RD 2 Box 83D-8, Milford, DE 19963, Mike Roe, (302) 422-6766



T&C Raceway, Rt. 113 South, Georgetown, DE 19947, Sam Thompson Jr., (302) 856-3804



T.M.T. Hobbies & Raceway, 609 Stein Hwy., Seaford, DE 19973-0464, Thorpe Stratney, (302) 628-0520



FLORIDA

B+T R/C Central, 811 Playground Rd., Ft. Walton Beach, FL 32547, (904) 863-2666



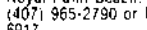
Barry's R/C Raceway, 2701 SW College Rd., #603, Ocala, FL 32674, Barry Lees, (904) 237-4400



Branford R/C Speedway, Rt. 3, Box 240, Branford, FL 32008, (904) 935-0758



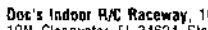
Challenger Speedway at the Willows, Willows Park & Okeechobee Blvd., Royal Palm Beach, FL 33414, Walt, (407) 965-2790 or Mark, (407) 790-6917



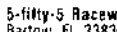
Coral Springs Roadrunners, P.O. Box 9632, Coral Springs, FL 33075, Tom Allison, (305) 721-0344 or Rick Schwartz, (305) 344-1983



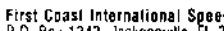
Doc's Indoor R/C Raceway, 16803 US 19N, Clearwater, FL 34624, Steve "Doc" Wacholz, (813) 824-7702



5-fifty-5 Raceway, County Rd. 555, Bartow, FL 33830, Chuck Nolke, (813) 324-7405



First Coast International Speedway, P.O. Box 1342, Jacksonville, FL 32201-1342, Bob Thompson, (904) 743-2161



FL Lauderdale R/C Speedways, 2201 NW 9th Ave., Mills Pond Park, Ft. Lauderdale, FL 33314, Jack or Diane Koons, (305) 424-6617



FYRE (Family & Youth Racing Enthusiasts), 507 Clifford Ave., Eustis, FL 32726, Ray or Robert, (904) 357-1635 or 589-0584



Greater Orlando Auto Racers, 970 Keller Rd., Altamonte Springs, FL 32714, Dave Motin, (407) 293-7090



H&H Raceway, 4121 S. Tamiami Tr., Sarasota, FL 34231, (813) 922-7711



Hialeah Hobby Raceway, 4562 W. 12 Ave., Hialeah, FL 33015, (305) 826-3702



Hobby Shop Speedway, 4805 Hwy. 22, Panama City, FL 32404, Larry Pollock, (904) 763-4599



JARCAR Raceway, 7273 103rd St., Jacksonville, FL, Rob Kruse, (904) 272-6315



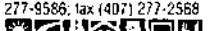
Kenny's Track & Hobby, 11125 U.S. 41 South, Gibsonton, FL 33534, Kenny Pylas, (813) 671-9123



Lake Whippoorwill International Speedway, 12345 Narcoossee Rd., Orlando, FL 32827, Bob Hosh, (407) 277-9586, fax (407) 277-2589



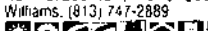
Treasure Coast R/C Club, 4931 Oleander, Fort Pierce, FL 34982, Lou, (407) 464-3207



M&M R/C Raceway, 16921 Waterline Rd., Bradenton, FL 34202, Mike Williams, (813) 747-2889



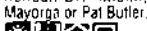
McBility R/C Raceway, 3rd St., Center, Cedar Key, FL 32825, Wilbur McBility, (804) 543-5628



Miami R/C Speedway, 12546 N. Kendall Dr., Miami, FL 33186, Jeff Mayorga or Pat Butler, (305) 271-3101



Miami Speedway, 7805 NW 148th St., Miami Lakes, FL 33014, Julio Romero, (305) 687-6728



Ocala R/C Car Club, P.O. Box 70166, Ocala, FL 32670, Larry E. Mitchell, (904) 245-2609, Steve Shook, (904) 694-5147



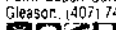
Oceanside Raceway, 206 E. Eau Gallie Blvd., Indian Harbour Beach, FL 32937, Michael Kelly, (407) 242-0434



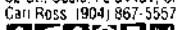
Paul's R/C Track & Hobby, 4511 Dr. M.L. King Blvd., Suite 8, Tampa, FL 33614, Paul or Eula Surrette, (813) 872-8662



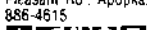
PBG R/C Motor Park, 6351 Barbara St., Palm Beach Gardens, FL 33410, Doug Gleason, (407) 743-9791



Performance Plus Raceway, 2820 SE 62 St., Ocala, FL 34481, Charlie Floyd or Carl Ross, (904) 867-5557



Pro Hobbies Speedway, 715 N. Lake Pleasant Rd., Apopka, FL 32712, (407) 886-4615



R/C Action, 646 Choy Lee Circle, Orlando, FL 32708, (407) 695-6746



Raceway Hobbies, 1115-J Enterprise Ct., Holly Hill, FL 32117, (904) 258-7537



Ray's Track & Hobby, 4605 W. Cayuga St., Tampa, FL 33614, (813) 872-8662



Renial Raceway, 3655 S. Hopkins Ave., Titusville, FL 32780, (407) 383-0631



River City R/C Car Club, 9711 Sharing Cross Dr., Jacksonville, FL 32257, Bill Fraden, (904) 268-1948



Southern Hobbies, 10 N. Magruder Ave., Orlando, FL 32805, Mike Spehn, (407) 521-7479



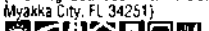
Southwest Florida R/C Raceway, 2425 Rivers Rd., Naples, FL 33964, Clyde Armstrong, (813) 455-1143



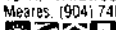
Space Coast Raceway, 563 Barton Blvd., #17, Rockledge, FL 32955, Bill Pinch, (405) 631-4373



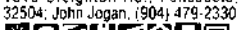
Sun Valley Speedway, Palmer Blvd., Sarasota, FL 34232, (813) 322-1200, (mailing address, Rt. 1, Box 443N, Myakka City, FL 34251)



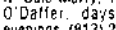
Three Flags R/C Racetrack, Rt. 2 Box 48-A, Wildwood, FL 34785, Don Meares, (904) 748-3870



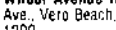
TJ's R/C Raceway & Hobby Shop, 1010 Creighton Rd., Pensacola, FL 32504, John Jogan, (904) 479-2330



West Coast R/C Club, Lake Park, 17203 N. Dale Marry, Tampa, FL 33549, Tim O'Daffer, days, (813) 969-3683 evenings, (813) 239-9630



Wilbur Avenue Raceway, 1848 Wilbur Ave., Vero Beach, FL 32960, (407) 567-1200



GEORGIA

ARCAR Raceway, 6894 Buford Hwy., Doraville, GA 30340, Greg Coan, (404) 448-4533



Carnesville R/C Speedway, Rt. 2, Box 2354, Carnesville, GA 30521, Bobby Maxwell or Byron Sarlin, (404) 384-4876 or 384-4587



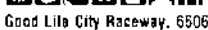
Case R/C Raceway, P.O. Box 1061 Trenton, GA 30752, (404) 657-6789



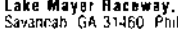
Dalton Raceway, 2300 Chattahoochee Rd., Dalton, GA 30720, (404) 226-6699



Georgia Hobby Center, 112 Kenwood Rd., Fayetteville, GA 30214, (404) 460-1753



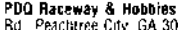
Good Life City Raceway, 6806 Newton Rd., Albany, GA 31707, (912) 888-2515



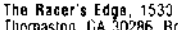
Lake Mayer Raceway, 1 Melinda Savannah, GA 31460, Phil Hurd, (912) 355-6033



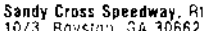
Middle GA Slot Car, 1805A Watson Blvd., Warner Robins, GA 31088, Larry Tucker, (912) 922-RACE



PDO Raceway & Hobbies, 341 Senola Rd., Peachtree City, GA 30269, Richard Burdett, (404) 631-1788



The Racer's Edge, 1530 Hwy. 19 N., Thomaston, GA 30286, Roger or Mark Walls, (706) 648-2637, (706) 648-6534



Sandy Cross Speedway, Rt. 1, Box 1013, Royston, GA 30662, Morris Phillips or Wayne Fowler, (404) 245-9573



Silver Wings Raceway, 5611 Riverdale Rd., College Park, GA 30349, (404) 991-2225



Sugar Bowl R/C Speedway, 5272 North Ave., Sugar Hill, GA 30518, Shelley or Jan Bailey, (404) 945-6709



HAWAII

The Hobby Habit, c/o 70 Kaahumanu Ave., Kaneohe, Maui, HI 96732, Blaine or Teri Ferreira, (808) 871-6666



K/M's Hobbies, 2365 Jasmine St., Honolulu, HI 76816, George Minkirana, (808) 757-7135



Koha R/C Racing, 74-5563 Kaimi St., Kailua-Kona, HI 96740, Hobby-Tronics, (808) 329-3072



R/C Motorsports Hawaii, 98-029 Hekana St., Aiea, HI 96701, Lane Petrich, (808) 487-5155

MARA, 1229 Burrell, Lexington, ID 83501, Rich Law, (208) 743-4141



Victory Speedway, 5416 Anna St, Boise, ID 83705, Bruce Wallace, (208) 343-3113



ILLINOIS

Adam's Blast Track, RR 1, Box 370, Ashmire, IL 61912, John Deffenbaugh, (217) 349-8447



AJ's Raceway, Kessinger Road, DeKalb, IL 60115, AJ Schultz, (815) 756-2772



Ameri-Trac, R3, Box 242, Mattoon, IL 61938, (217) 234-8707



Badlands II, 329 W. Jackson St., Vandalia, IL 62472, (618) 283-2913



BARR, 809 River Dr., Byron, IL 61010, Jim Haines, (815) 234-5615



C&R Hobbies, 39 E. Jones, Milford, IL 60953, Ray Graghead, (815) 889-4073



Centennial Park/LaMont Dirt Burners, 7827 Rahner Dr., Downers Grove, IL 60516, Scott Moravik, (708) 966-6411



Central Illinois R/C Car Club, contact Ron Buhi, 109 Oliver N., Pekin, IL 61554, (309) 382-2591 or Randy House, 510 S. 10th, Pekin, IL 61554, (309) 347-4912



Central R/C Raceway, RR 2, Box 51-A, Carlinville, IL 62626, Tim Stewart, (217) 854-9718 or Don Rice, (217) 854-3785



Diehard R/C Raceway, 300 N. Main, Keokuk, IL 61443, Dick Jennings, (309) 852-3700



Eagle Speedway, 333 N. Plum St., Portia, IL 61764, Joe or Vickie Bachman, (815) 842-1738



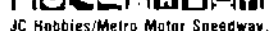
Hobby Raceway, 5027 4th Ave., Moline, IL 61265, Tony, (309) 755-5534



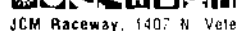
Hobby Town Raceway, 4611 W. Rt. 120, McHenry, IL 60050, Mike Hollingsworth, (815) 344-1777



Howell Racing, 492 Egret Ave., Naples, IL 33963, PJ Howell, (708) 474-8821



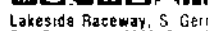
JC Hobbies/Metro Motor Speedway, Metropolitan Airport, Metropolis, IL 62960, (618) 524-9979



JCM Raceway, 1407 N. Veterans Pkwy., Bloomington, IL 61704, Pet & Hobby World, (309) 662-4698



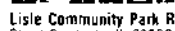
JMP Raceway, 952 Harrison Ave., Wood River, IL 62095, (618) 258-0297 or (202) 822



Lakeside Raceway, S. Germantown Rd., Breese, IL 62230, Scott Merian or Alan Poettiker, (618) 526-4861 or 654-2211



Leisure Hours Hobbies, 2672 Plainfield Rd., Joliet, IL 60435, (815) 439-1477



Lisle Community Park Raceway, 1825 Shiloh St., Lisle, IL 60532, Jim Bernicky, (708) 416-6944



M&E Hobbies & Raceways, 300 N. Milwaukee Ave., Lake Villa, IL 60046, Mark Kaye, (708) 356-3224



Machesney Park, 1220 Shappert Dr., Machesney Park, IL 61115, (815) 282-1311



Magnum R/C Speedway, RR #2, Box 399, Danville, IL 61832, Terry & Nancy Oines, (217) 446-2472



Marty's R/C Hobby, 1335 E. Broadway, Bradley, IL 60915, Gail or Marty, (815) 933-8431



Mercur Co. R/C Off-Road, RR 3 Box 259, Milan, IL 61264, Jamie Wagal, (309) 534-8324



Midwest Hobby Trax, 114 Kirkland Cr., Unit A, Oswego, IL 60543, Duane Pierson or John Koonce, (708) 978-RACE



Monroe R/C Raceway, 26049 Ridgeland Ave., Monroe, IL 60449, (708) 534-2422



Peoria R/C Raceway, 518 Hillside Ave., Peoria, IL 61604, Ray Tigue, (309) 672-1780



Precision Speedway, 3919 17th St. East, Moline, IL 61244, Dan Kennedy, (309) 796-2225



R/C Speed Zone, 1400 E. Lafayette, Bloomington, IL 61701, (309) 662-RACE



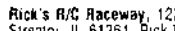
The R/C Track, 15022 S. Artesian, Harvey, IL 60426, Edmund Johnson, (708) 331-4079



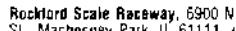
Radio Active Raceways, 751 N. Bolingbrook Dr., #15, Bolingbrook, IL 60440, Jim or Lenny, (708) 759-7557



Redline Raceway, 921 Harding, Calumet City, IL 60409, (708) 862-6161



Rick's R/C Raceway, 122 W. 12th St., Sycamore, IL 61364, Rick Wallace, (815) 673-1870



Rochford Scale Raceway, 6900 N. 2nd St., Machesney Park, IL 61111, (815) 765-2970



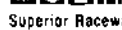
SIRCAR Raceway, 1200 N. Marion, Carbondale, IL 62901, (618) 539-5885



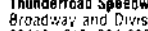
Slot Wing Hobbies Race Place, 1615 W. Springfield, Champaign, IL 61821, (217) 359-1920



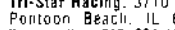
Smithton Community Park, P.O. Box 8152, Belleville, IL 62221, (618) 236-7569



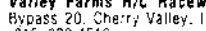
Superior Raceway, 1706 W. Bradley, Champaign, IL 61821, (217) 359-8073



Thunderbolt Speedway, Intersection of Broadway and Division, Coal City, IL 60416, (815) 634-8053



Tri-Star Racing, 3710 B. Hwy. 111, Pontoon Beach, IL 62450, Skip Bormueller, (618) 931-1206



Valley Farms R/C Raceway, 706 Bypass 20, Cherry Valley, IL 61016, (815) 332-4516



INDIANA

Autograph/Race World, 231 Pendleton Ave., Pendleton, IN 46064, Sam Mudd, (317) 778-3386



BJ's Riverside Raceway, 265 S. Clay St., Jasper, IN 47546, Joe Jorey, (812) 482-3484



Blaze'n Race'n, P.O. Box 6, Hamlet, IN 46532, James Berrot, (219) 867-1324



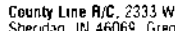
Boone County Raceway, 1300 E. 100 S. Rd., Lebanon, IN 46052, Jerri Moss or Allan Luper, (317) 482-4827



CC Hobby & Speedway, RR 1, Box 68, Francesville, IN 47946, (219) 567-2447



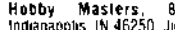
Classic Hobbies, 420 E. Commercial Lowell, IN 46355, David Scheff, (219) 898-0649



County Line R/C, 2333 W. State Rd. 38, Sheridan, IN 46068, Greg Welch, (317) 758-6393



Hobby Barn Raceway, 1950 Springhill Terre Haute, IN 47802-9694, (812) 299-5773



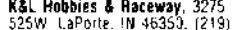
Hobby Masters, 8501 Bash, Indianapolis, IN 46250, Jim Price, (317) 576-1961



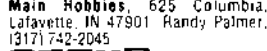
The Hobby Prescription, 115 S. Indiana Ave., Auburn, IN 46706, Roxanne Fike, (219) 925-6699



Hobby World Raceway & Hobbies, 1508 N. Harlan, Evansville, IN 47711, Jeff Wassman, (812) 421-1100



K&L Hobbies & Raceway, 3275 North 525 W., LaPorte, IN 46353, (219) 324-0353



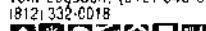
Main Hobbies, 625 Columbia, Lafayette, IN 47901, Randy Palmer, (317) 742-2045



Mooreville R/C Hobby, 7 Moore St., Mooreville, IN 45158, (317) 831-8877



PAT Hobbies and Raceway, RR 2 (Hwy 60), Mitchell, IN 47446, Paul Weber, Tom Logsdon, (812) 849-6686, fax, (812) 332-0018



R/C Barn, 310 N. 25 W., Monroe, IN 46772, Mark Lengerich, (219) 692-6600



R/C World of Indiana, RR #2, Box 335, Lynn, IN 47355, (317) 874-2464



R/C Zone & Raceway, 6380 W. 34th St., Indianapolis, IN 46224, Russ or Greg, (317) 290-0067



Race St. Raceway & Hobby, 11261/2 Race St., New Castle, IN 47362, John or Nancy Strong, (317) 521-4888



Raceway Park, 919 E. McKinley, Mishawaka, IN 46545, Bob Bean, (219) 256-1020



Radio Car Crawl, 1925 S. Curry Pike, Bloomington, IN 47403, (812) 332-3245



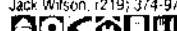
The Rink, 7900 Whitcomb, Merrillville, IN 46410, Don Reimer, (219) 769-8113



Runway Hobbies Raceway, 5342 Elmwood, St. J., Indianapolis, IN 46203, Randy Hyatt, (317) 784-2421



TQ Hobbies & Raceway, 13710 Wicker Ave. (Rt. 41), Cedar Lake, IN 46303, Jack Wilson, (219) 374-9776



Winner's Circle Speedway, State Road 10 and 55, Rosselawn, IN 46310, Harold Holmes, (219) 987-4106



IOWA

Barnyard Raceway, RR1, Box 243, Plainfield, IA 50666, Fred Good, (319) 276-4825



Devil's Valley, 919 4th Ave. So., Clinton, IA 52732, (319) 243-7516



Dubuque R/C Speedway, Dubuque County Fairgrounds, Dubuque, IA 52001, Paul Conlon, (319) 556-2736



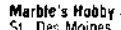
Hobby Haven Raceway, 7672 Hickman Rd., Des Moines, IA 50322, Brian Oakley, (515) 276-8785



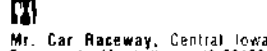
Kodiak Race Track, Box 78, Okoboji, IA 51555, Brad or Dave, (712) 332-7982



M&M Racecraft, 2434 Pilsbury Path, Okaloosa, IA 52577, (515) 673-6265



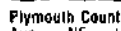
Marble's Hobby Supply, 4685 SE 40th St., Des Moines, IA 50320, Rick Marble, (515) 262-7507



Mr. Car Raceway, Central Iowa Fairgrounds, Marshalltown, IA 50158, (515) 483-2234



North Park R/C Speedway, 805 S. Jerome, Algona, IA 50511, (515) 295-9352



Plymouth County R/C Speedway, 4th Ave. NE (Plymouth County Fairgrounds), LeMars, IA 51031, (712) 546-8788 or 546-9522



Power House Racing, 1200 S. Division St., Creston, IA 50801, (515) 782-4582 or 782-4174



River City R/C Speedway, 317 2nd NW, Mason City, IA 50401, Leonard Johnson, (515) 423-7333



Rotunda Raceway, 101 Bass, RR 1, Box 155A, Storm Lake, IA 50588, (712) 732-4555



Sibley Raceway, Osceola County Fairgrounds, Sibley, IA 51249, Allen Reck, (712) 754-2604



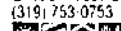
Southwest Iowa R/C Raceway, Kelly Park, Red Oak, IA 51566, (712) 623-5513



Spenser R/C Raceway, 419 Grand Ave., Spenser, IA 51301, Steve or Mike, (712) 262-2603 or 7864



Team Johnson Speedway, Jct. Hwy. 34 & 406, West Burlington, IA 52655, (319) 753-0753



KANSAS

ACE Raceway, 325 Commercial Emporia, KS 66801, Luke Amend, (316) 343-1933

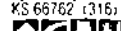


Chad's R/C World & Raceway, 217 Browne Ave., P.O. Box 76, Scranton, KS 66537, (913) 793-2313



Ebersole R/C Superspeedway, 11417 W. Hwy. 54, Wichita, KS 67209, Len Ebersole, (316) 722-8888

Pittsburg International Mini Speedway, 5111-2 N. Locust Pittsburg, KS 66762, (316) 232-1973



R/C Superdome & TQ Pro Shop, 14 E. Ave. A, Hutchinson, KS 67501, (316) 665-6633



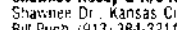
R/C World & Raceway, 217 Browne Ave., Scranton, KS 66537, Corry Green, (913) 793-2313



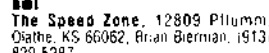
R&R R/C Raceway, 900 N. Santa Fe Salina, KS 67401, (913) 823-7062



RCRC Raceway, 507 N. 4th Atwood, KS 67730, Bob Dunker, (913) 626-3261



Shawnee Hobby & R/C Raceway, 4603 Shawnee Dr., Kansas City, KS 66106, Bill Pugh, (913) 384-3211



The Speed Zone, 12809 Pilsbury, Olathe, KS 66062, Brian Bierman, (913) 829-5287



KENTUCKY

A&J Raceway, P.O. Box 322-A, Lih, KY 40740, A. Smith, (606) 523-9710



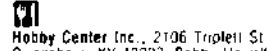
Bluegrass Int'l Perry's R/C Hobbies, 214 Globe St., Radcliff, KY 40160, William Perry, (502) 351-RACE



East Kentucky Hobby Raceway, Hwy. 15, Garner, Mt. Vernon, KY 41824, (606) 633-8567



Fast Lane Hobbies & Raceway, 281 Porter Pike, Bowling Green, KY 42101, Greg Bailey, (502) 782-2419



Hobby Center Inc., 2106 Triplett St., Owensboro, KY 42303, Bobby Howell, (502) 683-7611

Track Directory

River Cities Raceworld, 1104 Powell Ln., Flatwoods, KY 41139, (606) 836-6345



Tri-City R/C Raceway, 2420 Riddle St., Ashland, KY 41101, Eddie Williams, (606) 324-6305



West Kentucky R/C Cars, 45 Hawkins Loop, Symsonia, KY 42082, (502) 851-3534



LOUISIANA

Acadiana R/C Hobbies & Raceway, 120 Toledo Dr., Lafayette, LA 70506, (318) 235-5825



Baha Raceways, 2225 Hickory Ave., Harahan, LA 70123, Bruce or Dan Rodriguez, (504) 737-6988



Cajun R/C Raceway, Rt. 2, Box 288 (Hwy. 343, Boston Church Point, LA 70525, Ray Thibodeaux, (318) 873-3855



Cajun R/C Raceway, 110 A Darbonne Sulphur, LA 70663, Sandy Thibodeaux, (318) 527-9129



Johnny V's R/C Hobby & Raceway, 1036 W. Airline Hwy., LaPlace, LA 70068, Johnny V or Shawn Adams, (504) 651-9045



Loupe's R/C, 888A Madeline Ct., Baton Rouge, LA 70815, Mark Loupe, (504) 927-6275



Oakdale Raceway, 1259 Hwy. 165 S., Oakdale, LA 71463, M.L. Jezewski, (318) 335-3532



Performance Hobby Raceway, 9135 W. Judge Perez Dr., Chalmette, LA 70044, Guy Trentecosta, (504) 271-2468



Red River R/C, 3232 East 70th, Shreveport, LA 71105, Pete Bradford or Ken Adcock, (318) 424-6325 or 929-7378



MAINE

Central Maine R/C Speedway, 16 Lithgow St., Winslow, ME 04901, David Prescott, (207) 877-2232



Clay Bowl R/C Hobbies, P.O. Box 61, Greene, ME 04236, Pat Cap, (207) 946-5003



Fast Track R/C Raceway, P.O. Box 247, Gardiner Rd., Sabattus, ME 04280, Raymond Nadeau, (207) 375-4779



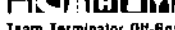
Mementos Hobby Shop, 86 Sweden St., Bar Harbor, ME 04736, (207) 498-3711



Rocket R/C Hobbies, Annabessacook Rd., Winthrop, ME 04364, (207) 377-6910



Sanford Speedway, 479C Elm St., Biddeford, ME 04005, (207) 282-8838



Team Terminator Off-Road Track, c/o Hobbies Plus, 479C Elm St., Biddeford, ME 04005, (207) 282-8838



The Racers' Club, 85 Hubbard Rd., Berwick, ME 03901, (207) 698-5337



Wallbanger Heaven, 50 Elm St., Houlton, ME 04730, Jack Newman, (207) 532-3169



MARYLAND

ABC Raceway, 2825 Ocean Gateway, Cambridge, MD 21613, (301) 228-4291



Bel Air R/C Raceway, 2276 Gateway Dr., Bel Air, MD 21014, Jeff Little, (410) 838-1229



Cockeysville Astrodomo, 10824 York Rd., Cockeysville, MD 21030, (410) 666-1098



Doug's Hobby Shop Raceway, Rt. 301N, Box 328, Waldorf, MD 20601, (301) 843-7774



40 Speedway, 933 Puleski Hwy., Havre de Grace, MD 21078, Doug or Vince, (410) 538-3135 or 939-3588



Friendship Off-Road Racers, 1531 Florida Ave., Severn, MD 21144, (301) 551-3050



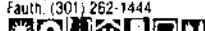
Fruitland Indoor Race Center, 203 N. Fruitland Blvd., Fruitland, MD 21826, Thomas Duncan, (410) 543-4329



Maryland R/C Track, 4201 G.B. Road, Seabrook, MD 20680, (301) 279-2956



Radio Control Cars Inc., 13600-A Annapolis, Bowie, MD 20715, Paul Fauth, (301) 262-1444



Suzie Goose Hobbies, 718 E. Gude Dr., Rockville, MD 20850, (301) 279-2956

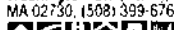


The Track, 16806 Oakmont Ave., Gaithersburg, MD 20877, Minn Wong, (301) 417-9630



MASSACHUSETTS

Archer's Lane R/C Raceway, 118 Washington St., (Rt. 1), S. Attleboro, MA 02730, (508) 399-6762



C&C Hobby & Raceway, 562 Russells Mills Rd., S. Dartmouth, MA 02748, (508) 997-4131



Centerline Hobbies, 187 Corporation Rd., Hyannis, MA 02601, (508) 771-1244



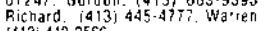
CKS Raceway, 46 Wilbraham St., Palmer, MA 01069, (413) 283-2260



Julio's Hobby & Speedway, 825 Main St., (Rt. 109) Milis, MA 02054, (508) 376-1933



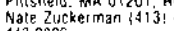
Megadrome Raceway/BRCCR, N. Adams Plaza, Rt. 8, North Adams, MA 01247, Gordon, (413) 653-9593



Richard, (413) 445-4777, Warren, (413) 442-2566



Mike's Speedway, Rt. 9, Mt. Farms, Mass., Hadley, MA 01035



Naylrix Raceway, Holmes Rd., Pittsfield, MA 01201, Rick Welch or Nate Zuckerman, (413) 443-2488 or 443-9886



R/C Hobbies & Speedway, 1311 Purchase St., New Bedford, MA 02740, (508) 991-5040



R/C Hobbies & Speedway, 5628 Reed Rd., N. Dartmouth, MA 02747, Rick or Dave, (508) 991-5040



R/C World Raceway, 100 Crawford St., Leominster, MA 01453, Dan, (508) 537-9733



West St. Hobbies, 114C Main St., Medway, MA 02053, (508) 533-1231



MICHIGAN

AJ's Superspeedway, 34722 Wick Romulus, MI 48174, Terry or Al, (313) 942-9189



Baja Bayou Off-Road Raceway, 5313 W. 22 Mile Rd., Tustin, MI 49688, Mike Langworthy, (616) 829-3447



Can-Am Hobbies Speedway Park, 1152 Grubbs, Marysville, MI 48040, Don Grinde, (313) 364-3338



Central Michigan R/C Raceway, 1270 James Savage, Midland, MI 48640, Mark Siebert, (517) 631-1488



Cereal City R/C Off-Roaders, 2000 E. Columbia Ave., Battle Creek, MI 49015, (616) 963-2506



Chatter Box Racing, P.O. Box 164, Old State Rd., Central Lake, MI 49622, Bill Allertott, (616) 544-9829



Dirt Slingers Raceway, 2460 S. M139, Benton Harbor, MI 49022, Tom Edwards, (616) 927-1431



ONR Speedways, 4630 Hill Rd., Harbor Beach, MI 48441, Kelcey, (517) 479-6097



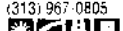
Doug's Dirt Way, 5210 Colby Rd., Oquossco, MI 48867, Doug Conn, (517) 723-3368



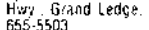
Elmer's R/C Speedway, 2683 Lakeshore Dr., Niles, MI 49120, Randy or Kristi Easton, (616) 683-7390



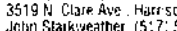
Farwell Park Raceway, 2781 E. Outer Dr., Detroit, MI 48234, Eddie McCray, (313) 967-0805



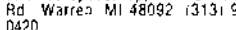
Fun Tyme High-Banked Oval, Fun Tyme Adventure Park, 6295 E. Saginaw Hwy., Grand Ledge, MI 48837, (517) 655-5503



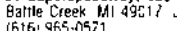
Harrison International Speedway, 3519 N. Clare Ave., Harrison, MI 48825, John Starkweather, (517) 539-2921



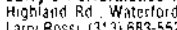
JJ's R/C Speedshop, 5645 E. 13 Mile Rd., Warren, MI 48092, (313) 977-0420



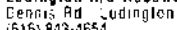
JT Superspeedway, 825 Golden Ave., Battle Creek, MI 49717, Jerry or Dan, (616) 965-0571



Larry's Performance R/C's, 3430 Highland Rd., Waterford, MI 48328, Larry Rossi, (313) 683-5529



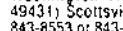
Ludington R/C Raceway, 1483 N. Dennis Rd., Ludington, MI 49431, (616) 843-4654



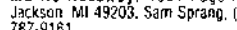
Mason County R/C Car Track, West Shore Community College, (611 N. Washington Ave., Ludington, MI 49431), Scottsville, MI 49454, (616) 843-8553 or 843-4837



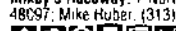
MC-RC Raceway, 4601 Page Ave., Jackson, MI 49203, Sam Sprang, (517) 787-9161



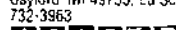
Mike's Raceway, 7 North St., Yale, MI 48097, Mike Huber, (313) 387-4308



NMRCC Raceway, 110 N. Ostego, Gaylord, MI 49735, Ed Schneider, (517) 732-3963



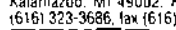
Pointe R/C, 2119 Summerton Rd., Mt. Pleasant, MI 48858, Frank, (517) 773-5711



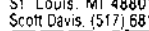
R&L Hobbies, 9782 Portage Rd., Kalamazoo, MI 49002, Rex Simpson, (616) 323-3686, fax (616) 329-1744



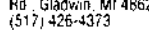
R&S Hobbies & Raceway, 230 Mill St., St. Louis, MI 48801, Rich Beard or Scott Davis, (517) 681-3463



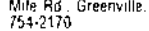
Rad & Bad Raceway, 810 S. Marlin Rd., Gladwin, MI 48624, Mick Bushong, (517) 426-4373



Radio Wave Hobbies, 14000 Old 14 Mile Rd., Greenville, MI 48838, (516) 754-2170



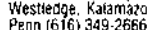
Rider's Superspeedway, 42040 Koppernick, Ste. 400, Canton, MI 48187, Brent Martin, (313) 451-5599



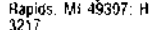
Rider's Superspeedway, 4415 S. Westledge, Kalamazoo, MI 49008, Ken Penn, (616) 349-2666



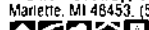
T/A Raceway, 119 N. Michigan, Big Rapids, MI 49307, Harvey, (616) 796-3217



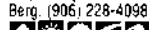
Thumb Raceway, 3441 S. Main St., Mariette, MI 48453, (517) 635-7848



TNT R/C Raceway, 130 W. Washington St., Marquette, MI 49855, Gregory Berg, (906) 228-4098



USA Raceways, 6803 Dixie Hwy., Bridgeport, MI 48722, (517) 777-7054



Village Hobbies-n-Crafts, 17824 N. Maple Island, Hesperia, MI 49421, Alan or Fran, (616) 854-1374



MINNESOTA

ABC Raceway, 120 2nd St. NW, Pipestone, MN 56164, Ross Lange, (507) 825-5065



Season Sport & Hobby, 312 N. Bdwy., Crookston, MN 56716, Caesar Kaiser, (218) 281-6665



Dr. Skate's R/C Raceway, Frontage Road La Crescent, MN 54601, Gary Behrens, (808) 788-6141



Greater Minnesota Racin' Place, 3302 Southway Dr., St. Cloud, MN 56301, Jon Jackson, (612) 252-9768



K&C's, 2172 North 6th St., North St. Paul, MN 55109, (612) 777-3313



Minn-E-Golf & Hobby, 9100 Park Ave., Elk River, MN 55330, (612) 441-8365



The PBR Off-Road Rally, 721 Cedar Ave., Hector, MN 55342, Philip Zempel, (812) 848-2129



Range Racing World, Inc., 412 Jones St., Eveleth, MN 55734, Bill, (218) 744-4423



Squid's R/C Autos, 924 Main Avenue, Moorhead, MN 56560, Jeff Greenwell, (218) 233-3554



Trackside Racing, 2300 Myrtle Ave., St. Paul, MN 55114, Winton Oftele, (612) 644-3424



Wild West R/C Speedway, 2822 Piedmont Ave., Duluth, MN 55811, Roger Deloach, (218) 727-6248



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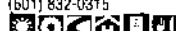
Crossroads Raceway, Mall of Cornith, Rt. 1, Box 1, Cornith, MS 38834, (601) 287-2110



Dixieland R/C Speedway, 2535 Tabernacle Rd., Columbus, MS 39702, Jeffrey Alvey, (601) 328-9429



Fast Freddy's Raceway, 20390 Hwy. 49, Saucier, MS 39574, Mark Payne, (601) 832-0315



Joe McFadden Hobbies, 1619 51st Ave., Meridian, MS 39307, Joe McFadden, (601) 483-7000



1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 84

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Track Directory

Pit Stop Dragway, Campus Rd., Totowa, NJ 07512. Kimberly Frank. (201) 942-5955



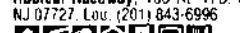
Pixley International Speedway, 763 Peters Dr., P.O. Box 189, Martinsville, NJ 08836. Richard Toole. (908) 560-0399



The Race Place, 1151 Hwy. 33, Farmingdale, NJ 07731. John Fary. (908) 938-5215



Radical Raceway, 100 Rt. 17S, Lodi, NJ 07727. Lou. (201) 843-6996



Ricky G's Raceway, 2208A Hamilton Blvd., South Plainfield, NJ 07080. (908) 753-1518



S&M Speedway, 4 Field Rd., Bedminster, NJ 07921. Lee Spano. (908) 234-2750



Spennell Speedway, 2301 Rte. 9 North, Great American Flea Market, Howell, NJ 07731. Mitch. (908) 577-9191



Tri-Oval Speedway & R/C Center, 296 S. Main St., Phillipsburg, NJ 08865. (908) 454-2223



Truck Challenge, 1162 Rt. 202-206 N., Bridgewater, NJ 08807. Michael Gull. (908) 658-9616



Zeppelin Hobbies, 92 Rt. 23N, Riverdale, NJ 07457. Lou Ballini. (201) 831-7717



NEW MEXICO

CJH Hanger R/C Raceway I, 1515 E. 20th Space D., Farmington, NM 87401. Butch or Joey. (505) 327-3187



CJH Hanger R/C Raceway II, 2508 Fox St., Farmington, NM 87401. Butch or Joey. (505) 327-3187



Hobby Connection Raceway, 1713 Indian Wells Rd., Alamogordo, NM 88310. Terry Billings. (505) 437-0885



The PH, Las Cruces Hobby Raceway, 1998-A S. Valley Dr., Las Cruces, NM 88001. (505) 524-8530



Roswell R/C Raceway, 1004 N. Greenwood, Roswell, NM 88201. Larry Jumper. (505) 623-6693



TRC Race Park, 1303 E. 8th St., Truth or Consequences, NM 87901. Gary Whitehead. (505) 894-3211



NEW YORK

A&D's FastTracks, 1000 N. Main St. Brewster, NY 10509. (914) 279-2065



A&S Race Center & Hobbies, 120 Cayuga St., Canajoharie, NY 13069. (315) 598-2772



Aldon Speedway, 100 Castle St., Geneva, NY 14456. (315) 789-8343



Brockport Speedway, 6000 Sweden Walker Rd., Brockport, NY 14420. Gu & Betty Glidden. (716) 637-6224



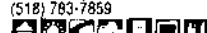
Brownie's Pro & Sport Hobbies, 124 Bennett St., Staten Island, NY 10302-1426. John Brown. (718) 727-2194



Cars R/C & Guitars, 4360 Seneca St., West Seneca, NY 14224. (716) 674-0905



Capital District R/C Racers, 27 Venus Dr., Albany, NY 12205. Keith Green. (518) 783-7859



Catskill Regional R/C Raceway, Glasco Turnpike, Marion, NY 12456. (914) 339-3294



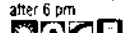
Central New York R/C Auto Racers, Martin St., P.O. Box 116, Rome, NY 13440. John Orr. (315) 336-5140



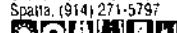
Chipmuck Hill R/C Speedway, 217 Pine St., Theresa, NY 13961. Ted House. (315) 628-5065



Creekside R/C Raceway Park, 5242 Route 228, Trumansburg, NY 14886. Lawrence C. Uppike. (607) 387-5513 after 6 pm



D&J's Speedway, 94 Maple St., Croton-on-Hudson, NY 10520. Dan Spatta. (914) 271-5797



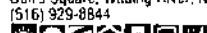
Daytons Miniature Raceway, 59 Lamar St., W. Babylon, NY 11704. (516) 491-4041



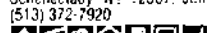
Dirt Track, 17 Fairway Dr., Manorville, NY 11949. Billy Wroblewski. (516) 878-0737



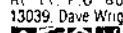
East End Off-Roaders, Route 25A at Gull's Square, Wading River, NY 11792. (516) 929-8844



Electric City Speedway, 955 State St., Schenectady, NY 12307. Jim Delyser. (513) 372-7920



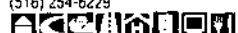
Garmen's R/C Motor Speedway, 8453 Rt. 11, P.O. Box 1430, Cicero, NY 13039. Dave Wright. (315) 699-2991



GP Racing, 6785 Martin St., Rome, NY 13440. Greg Philley. (315) 336-5140



Island Hobbies & Raceway, 410 Commack Rd., Deer Park, NY 11729. (516) 254-6229



HobbyTown USA, 629 Plank Rd., Clifton Park, NY 12065. Larry Burwell. (518) 383-1215



Lakeside Raceway & Hobbies, 712 Willow Ave., Ithaca, NY 14850. (607) 272-0248



Latest Hobbies & Raceway, 781 Rt. 25A, Rocky Point, NY 11778. Joe John. (516) 929-8844. fax (516) 929-5002



L1 1/4-Scale Racers, 63 Horton Dr., Huntington Station, NY 11746. (516) 351-5384



Maspeeth Raceway, Rust St. & 57 Rd. Maspeeth, NY 11378. Walter. (718) 897-7921



North Fork Pacesetters, Jimmy Jon's Hobby House, 7355 Main Rd., Maittuck, NY 11952. (516) 298-2020



Northwood Hobbies Raceway, 2-4 S. Main St., Northwood, NY 13668. Tom Jarvis. (315) 353-6621



Performance Hobbies Raceway, 205 North Ave., Webster, NY 14580. Anthony Genz. (716) 821-1274



Performance Plus R/C Speedway, The Hobby House, 1141/2 Jones & Gifford Ave., Jamestown, NY 14701. (716) 488-1772



Queens Off-Roaders, 42-12 13th St., Long Island City, NY 11101. (718) 392-5766



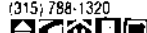
R/C Competition Corner, K-Mart Plaza, Mattydale, NY 13211. (315) 455-8718



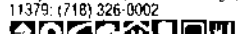
R/C Hobbies, Rt. 49, Box 138, Constantia, NY 13044. Roy Catholico. (315) 623-9536



R/C Speedway & Hobbies, 155 State St., Watertown, NY 13601. Steve Pena. (315) 788-1320



R/C World Hobby Center, 69-57 Juniper Blvd. S., Middle Village, NY 11379. (718) 326-0002



R&S Hobbies, 356 Macedon Ct. Rd., Fairport, NY 14502. (716) 425-3722



Raze O Rama, 44 Sharon Ave., Plattsburgh, NY 12901. James Varro. (518) 562-5442 or 643-2678



Rampage R/C, 53-57 Beadart Pl., Hyde Park, NY 12536. Brian Walker. (914) 229-2456



Ransomville, R/C Raceway, 2576 Academy St., Ransomville, NY 14131. Irene Preisch. (716) 791-8310



Riverside R/C & Hobby, P.O. Box 125, Rt. 126, Beaver Falls, NY 13305. (315) 346-1682



Rochester Raceway & Hobby, 1725 N. Clinton Ave., Rochester, NY 14621. George. (716) 467-2427



Rock River Model Hobbies, RD 2, Box 297, Rock River Rd., Interlaken, NY 14847. Carl Schmidt. (607) 532-4489



Russet's R/C Racetrack, 1793 Ridge Rd., Ontario, NY 14519. (315) 524-2522



Schoharie Co. R/C Car Club, P.O. Box 126, Cobleskill, NY 12043. (518) 234-4600



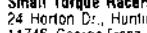
Seneca R/C, 2339 Yerkes Rd., Romulus, NY 14541. (315) 789-8343



Skaneateles Raceway & Hobby, P.O. Box 102, Rt. 20, W. Genesee St., Skaneateles, NY 13152. (315) 685-8077



Small Torque Racers of Long Island, 24 Horton Dr., Huntington Station, NY 11746. George Franz. (516) 271-1119



South Shore Hobby & Raceway, 311 W. Roe Blvd., Patchogue, NY 11772. Don Hauck. (516) 758-5567



Southern Tier Raceway & Hobbies, 88 Page St., Owego, NY 13827. Chet or Ania Harding. (607) 687-5395



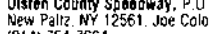
Team Earthquake, The Hobby House, 1141/2 Gones & Gifford, Jamestown, NY 14701. (716) 488-1772



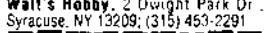
Transit Speedway & Hobbies, 5319 Transit Rd., Depew, NY 14043. (716) 684-7368



Ulster County Speedway, P.O. Box 71, New Paltz, NY 12561. Joe Colombo Jr. (914) 754-7664



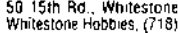
Walt's Hobby, 2 Dwight Park Dr., Syracuse, NY 13209. (315) 453-2291



Western New York R/C Speedway, 58 Spring St., Cuba, NY 14727. Jason Congdon. (716) 968-3586



Whitestone Off-Road Raceway, 149-50 15th Rd., Whitestone, NY 11357. Whitestone Hobbies. (718) 767-6767



NORTH CAROLINA

B-n-B R/C Raceway, 7805 S. Arizona Rd., Raleigh, NC 27604. Craig Barber. (919) 878-8407



Baldin Shore Raceway, 1730 Jackson Lake Rd., High Point, NC 27263. Jimmy or Tim Martin. (919) 431-9258



Big Kids Little Toys, 407-8 Pomona Dr., Greensboro, NC 27407. Joe Stewart. (919) 299-3355



C&H Raceway, 1400 N. Cannon Blvd., Kannapolis, NC 28083. Camera & Hobby Shop. (704) 933-5321



Cape Fear Speedway, 207 Harley Rd., Wilmington, NC 28401. Bob Justice. (919) 762-1184



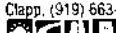
Carolina R/C Drag Assoc., 907-C Warsaw Rd., Clinton, NC 28328. (919) 592-9489



Carolina Hobbies R/C Raceway, Route 1, Box 158, Taylorsville, NC 28681. Kim & Roseanne Kulawik. (704) 495-4040



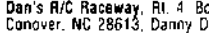
Clapp's R/C Motor Speedway, Rt. 4, Box 300A, Siler City, NC 27344. Al Clapp. (919) 663-3198



Clinton R/C Raceway, 907-C Warsaw Rd., Clinton, NC 28328. Corbitt Marshburn. (919) 592-9489



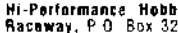
Dan's R/C Raceway, Rt. 4, Box 392A, Conover, NC 28613. Danny Dellinger. (704) 256-8963



Granite City R/C Raceway, 192-1 N. Main St., Mt. Airy, NC 27030. (919) 786-1466



Hi-Performance Hobbies & R/C Raceway, P.O. Box 320, Earl, NC 28038. Derrell Hollifield. Steve Bhs. (704) 482-4391



Hobbies, Etc., 5540 Atlantic Springs Raleigh, NC 27604. Don Asplen. (919) 790-1444



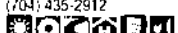
Hobby Park, W. Clemmons Rd., Winston-Salem, NC 27103. Dick Butler. Parks & Recreation. (919) 727-2063



The Hobby Speedway, Hwy. 25, P.O. Box 279, Naples, NC 28760. Jerry or Kelda Bowers. (704) 684-9814



Joe's Hobby Shop & Raceway, Rt. 2, Box 682-B, Bessemer City, NC 28016. (704) 435-2912



Mega Track of the Triad, 5540-105 Atlantic Springs Rd., Raleigh, NC 27604. Don Asplen. (919) 790-1444



Motorlead R/C Raceway, 125 Park St., Canton, NC 28716. (704) 648-7911



Mountain R/C Raceway, Hwy. 107N, P.O. Box 67, Glenview, NC 28736. (704) 743-3709



Outlaws Fasttrac Hobbies Raceway, 1013 Old Hendersonville Hwy., Brevard, NC 28717. Jeff Laws. (704) 885-RACE (7223)



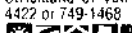
PC Hobbies, 143 Industrial Dr. King, NC 27021. Mike Ingles. (919) 983-2514



Reedy Creek Raceway, Rt. 14, Box 946, Conard Sowers Rd., Lexington, NC 27292. (704) 731-4022



S&B Speedway & Hobbies, Rt. 1, Box 311A, Farmville, NC 27828. Ricky Strickland or Van Bibbs. (919) 753-4422 or 749-1468



Sandhills Raceway Inc., US #1 South, Asheville, NC 28815. (919) 944-7414



Smiley Face Raceway, 120 W. Center St., Mebane, NC 27302. (919) 563-3822



Speed Performance, 4121 Lower Moncure Rd., Sanford, NC 27330. Howard Everett. (919) 774-3843



TLC R/C Raceway, Rt. 6, Box 321-A, Hwy. 601, Mocksville, NC 27028. (704) 492-7569



TNT R/C Raceway, 707 N. Salisbury Ave., Salisbury, NC 28159. Larry Martin. (704) 633-0647



Two Toms Hobbies, 155 Boone Square St., Hillsborough, NC 27278. Tom York. (919) 732-6221



Wilkes Hobby Supertrack, Rt. 1, Box 286-H, Ferguson, NC 28624. (919) 973-3734



Winston R/C Drag Series/Hobby Park Dragway, W. Clemmons Rd., Winston-Salem, NC. Jack Wright. (919) 983-9416



NORTH DAKOTA

Crystal Springs Off-Road, 1200 53 Ave. SW, Minot, ND 58701. (701) 852-9590



Hacienda Hills Speedway, 20 Hacienda Hills, Minot, ND 58701. Kenny Duchscherer. (701) 839-4419



Northern Mini Racers, P.O. Box 415
Minot, ND 58702 Patrick McWethy
(701) 839-8868

OHIO

AAAction Speedway, P.O. Box 6,
Monist, OH 43337 Tim McKnight (614)
465-9891 or Bill Harris (614) 387-5912

A&D R/C Raceway, 5096 Rt. 127 S.
Eaton, OH 45320 Aaron Garrett, (513)
432-1662

Aerotech Raceway, 409 Applegrove
Rd. North Canton, OH 44720 (215)
499-1300

Aircraft's R/C Raceway, 1370 Custer
Orangeville Rd., Brookfield, OH 44003,
(216) 448-1573

Alternative Racing Association,
Carlin R/C Speedway, 2600 17th St.
East Canton, OH 44730, Neal Evershat,
(216) 484-2587

American Raceway, 234 Robbins Ave.
Miles, OH 44446 George Nikoloff (216)
344-5455

Bryan Thunderdrome, Townline Rd.,
Bryan, OH 43506 Jeff Lehmann, (419)
636-9100

Buckeye Pulling Tracks, State Rt. 68
Xenia, OH 45385 Mark Harlings, (513)
376-8334

C/R Hobbies Top Race Track, 323
Center St. Ashtabula, OH 44004,
Virginia Gagar, (216) 992-3833

Classic Hobbies & Raceway, 2845 W.
Walbridge Rd., Akron, OH 44312 (216)
628-3222

D&J R/C Raceway, 801 W. Market St.
Grinnell, OH 44667 Don Yader or Mark
Hugstbaum (216) 687-4266

D&S Hobbies Raceway, 7701 Crile
Rd., Concord, OH 44077 (216) 354-
2712

FFA Speedway, 1001 Old Columbus
Rd., Wadsworth, OH 44776 Roger Franks,
(216) 264-1846

Flag City Raceway, 721 Rockwell Ave.
(truck address 3/72 C.R. 18), Findlay,
OH 45840 Ruth Hubbard (419) 422-
5589

Golden Bear Hobbies, 154 N.
Millbourne Rd., Orville, OH 44667, Bob
Rodi, (216) 683-1250

Hi Tech Hobbies II, 116 S. Taylor St.,
Loveland, OH 45140 Rick Lewis or
Richard Kosar (513) 683-8900

Hobby Mania Raceway, 6597 Route
223, Loveland, OH 44436 (216) 535-
8282

Innovative Hobbies/Lakeside
Speedway, 3427 Manchester Rd.,
Akron, OH 44319 (216) 645-1333

J&B Hobby & Raceway, 8760 St. Rt.
207, Tipp City, OH 45371, Bob Curtis,
(513) 845-8222

KAR R/C Raceway, 14511 Seacrest
Salem, OH 44460 Reid Tarves, (216)
537-4039

Lewisburg R/C Raceway, 395 US Rt.
40E, Lewisburg, OH 45338, Gene
Butler, (513) 678-9201

Medina City R/C Raceway, 3414
Runyon Rd., Medina, OH 44256, Eric
Pesto (216) 723-0255

Palma Speedway, 5729 Ridge Rd.,
Palma, OH 44129 Sam Belsito (216)
845-3796

Paulding R/C Speedway, 103 N. Main,
Paulding, OH 45879, Virgil Simminger,
(419) 238-0633

The Racer's Choice R/C Hobbies &
Raceway, 1298 US Rt. 42, Mason, OH
45040 (513) 398-5539

RBI R/C Speedway, 110 Springdale
Ave., Wintersville, OH 43952, Frank
Luckino (614) 264-9101

Right Choice Hobbies, 7760 Garrison
Ave., Cincinnati, OH 45247 (513) 353-
3343

Sleepy Hollow Raceway Park, 11189
Spear Rd., Concord, OH 44077, Gary
Walshelm, (216) 944-5898

Strongsville Speedway, 13315
Prospect, Strongsville, OH 44136,
(216) 572-0430

Trusso's R/C Raceway, 100 W. Crain
Ave., Kent, OH 44240 Bill (216) 673-
0422

Turn 4 Hobbies, 112 W. Main St., Van
Wert, OH 45891 Virgil (419) 238-6840

Way Out Hobbies, 5583 Centerpoint
Rd., Georgetown, OH 45121, (513)
375-9884

Woodlana Raceway, 2300 E. Dorothy
Lane, Dayton, OH 45420, Jeff Simpson,
(513) 298-1166

Y-City Hobby & Speedway, 120 S. 6th
St., Zanesville, OH 43701 Kevin
McKenna (614) 455-3025

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Palma Speedway, 5729 Ridge Rd.,
Palma, OH 44129 Sam Belsito (216)
845-3796

R/C Auto Racing, 501 Westland Dr.,
Edmond, OK 73034 Gary Garrett, (405)
348-9253

OREGON

AAAction Speedway, P.O. Box 6,
Monist, OH 43337 Tim McKnight (614)
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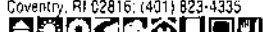
Track Directory

PUERTO RICO

Cachon Off-Road Track, Box 952, Barranquitas, PR 00794, (809) 857-0341


RHODE ISLAND

East Bay Hobbies, 629 Metacom Ave., Bristol, RI 02809, (401) 254-0778


R/C Hobbies, 47 Sandybottom Rd., Coventry, RI 02816, (401) 823-4335


Tri-State R/C Raceway, 205 Hallene Rd., Warwick, RI 02886, Raymond Dean, (401) 738-4908



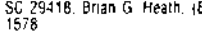

SOUTH CAROLINA

Bandits Performance R/C Hobbies, P.O. Box 1533, Darlington, SC 29532, Bryan Howle Jr., (803) 393-3333


Berea R/C Speedway, 707 Sulphur Springs Rd., Greenville, SC 29611, (803) 246-4702


Capitol City Raceway, 1955 Legrand Rd., Columbia, SC 29223, Lee Mouton or Brooks Shealy, (803) 788-7749 or 788-4669

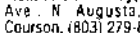

Coastal R/C Speedway, 8553 Hwy 544, Myrtle Beach, SC 29577, Wendel Smith, (803) 236-9309

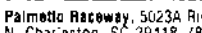

HMW Hobby Shop & R/C Raceway, 4930 Dorchester Rd., North Charleston, SC 29418, Brian G. Heath, (803) 760-1578


Inland R/C Speedway, 61 Newfound Lane, Myrtle Beach, SC 29577, James Watten, (803) 293-1753


Mid-Carolina R/C Superspeedway, 2222 Wintercrest Dr., Rock Hill, SC 29732, Fred Penland, (803) 328-8278

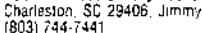

Monaco's Raceway, 727 E. Buena Vista Ave., N. Augusta, SC 29841, Bill Courson, (803) 279-8982


Palmetto Raceway, 5023A Rivers Ave., N. Charleston, SC 29418, (803) 566-0068


R/C Speed Shop & Raceway, 2122 Platt Springs Rd., W. Columbia, SC 29169, Eric Prevost, (803) 791-4715


Sidewinder's R/C Raceway Park, 1601-B West Enterprise St., North Charleston, SC 29406, Jimmy Closson, (803) 744-7441

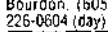

Simpsonville International R/C Speedway, 3039 Bethel Rd., Simpsonville, SC 29681, Larry Chappelle, (803) 297-3572

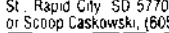

TBS Superspeedway, 800 Hwy. 15N, Hartsville, SC 29550, Johnny Tiller, (803) 332-7117


SOUTH DAKOTA

CSF Speedway, Central States Fairgrounds, Creative Arts Bldg., 800 San Francisco St., Rapid City, SD 57702, Scoop Laskowski, (605) 342-3292

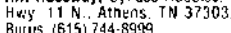

Dakota Off-Road Racers, 2989 W. Br. Co. 12, Aberdeen, SD 57401, (605) 226-0604


1/8-Scale Off-Road, 2989 W. Br. Co. 12, Aberdeen, SD 57401, Brian Bourdon, (605) 225-0803 (evening) 226-0604 (day)


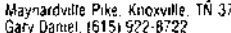
Flags of Fun R/C Raceway, 2802 Eglon St., Rapid City, SD 57702, Rex Conrad or Scoop Laskowski, (605) 341-2186


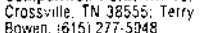
TENNESSEE

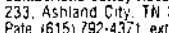
Action Hobby Shop, 3723 S. Mendenhall, Memphis, TN 38115, Brian Stricklin or Justin Austin, (901) 365-2620

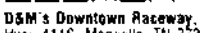

AIR Raceway, ByPass Hobbies, 1114 Hwy. 11 N., Athens, TN 37303, Bill Burns, (615) 744-8999


Butturi's Best Raceway, 4828 George Williams, Knoxville, TN 37922, Steve Butturi, (615) 531-0325

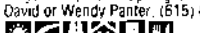

Crash-n-Burn R/C Raceway, 7030 Maynardville Pike, Knoxville, TN 37918, Gary Daniel, (615) 922-8722


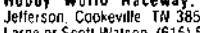
Competition Park, Rt. 10, Box 268, Crossville, TN 38555, Terry or Yvette Bowen, (615) 277-5348


Cumberland Valley Raceway, P.O. Box 233, Ashland City, TN 37015, Jamie Pate, (615) 792-4371 ext. 1195


D&M's Downtown Raceway, 2703 US Hwy. 411S, Maryville, TN 37303, (615) 681-8919


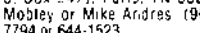
Estill Springs Raceway, P.O. Box 187, Hwy. 41-A, Estill Springs, TN 37330, David or Wendy Panter, (615) 649-5113

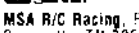

Hobby World Raceway, 185 S. Jefferson, Cookeville, TN 38501, Scott Large or Scott Watson, (615) 528-2808


Lail Speedway, 812 Wells Rd., Maryville, TN 37801, Jack or Chris, (615) 983-9207


Mad Dog Motorsports, 707 Joy St. (Rt. 3, Box 247), Paris, TN 38242, Dan Mobley or Mike Andres, (901) 642-7794 or 644-1523


MSA R/C Racing, Rt. 12 Box H89 B, Crossville, TN 38555, D.R. Findley, (615) 456-0027


Panther Traxx, 7030 Maynardville Hwy., Knoxville, TN 37918, Gary Daniel, (615) 922-8722


Raceplace, 215 Lynn Garden Dr., Kingsport, TN 37660, Randy Horton, (615) 378-3330


Rivergate Hobby Center, 700A Two Mile Pkwy., Goodlettsville, TN 37072, David Hitt, (615) 859-3455


RMD Raceway, 175 Seavers Rd., Jackson, TN 38301, Travis Robertson, (901) 424-0283

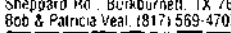

Smitty's Hobbies & Raceway, 6021 Dayton Blvd., Chattanooga, TN 37415, David Smith, (615) 877-9447

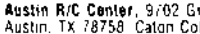

TNT Pro Hobbies, 5529 Pleasant View #2, Memphis, TN 38134, Tony Howell, (901) 377-0013


Tuckasee Off-Road Raceway, 1004 Lafayette Rd., Clarksville, TN 37042, Denny Hayward, (615) 645-2635


TEXAS

AA Raceway, 1617 Toomey Rd., Austin, TX 78704, (512) 474-8277


Anchored Acres Raceway, 1101 Sheppard Rd., Burkburnett, TX 76354, Bob & Patricia Veal, (817) 569-4707


Austin R/C Center, 9702 Gray Blvd., Austin, TX 78758, Calan Cobb, (512) 832-8144


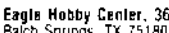
B&C Speedway, 201 Enterprise Row #101, Conroe, TX 77301, Bobby Hillin, (409) 760-1986


Budget Raceway, RR 1, Box 400 I-35, Bruceville, TX 76630, (814) 859-5296

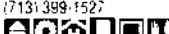

Checkeder Raceway, 7121 Perimeter Park, Suite 214, Houston, TX 77099, Rod Ward, (713) 849-3054


Dove R/C Speedway, 400 South I-35, Bruceville, TX 76663, Curtis A. Rowe, (817) 757-1150

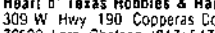

Eagle Hobby Center, 3601 Shepherd, Balch Springs, TX 75180, Terry Cooke, (214) 557-5290


Eastex Raceway, 45000 Hwy. 59 N., New Caney, TX 77357, Heinz Falke, (713) 399-1527


Hal's R/C Raceway, 1440 Bessemer, El Paso, TX 79936, (915) 591-2213


Heart n' Texas Hobbies & Raceway, 309 W. Hwy. 190, Copperas Cove, TX 76522, Larry Gholston, (817) 547-7505


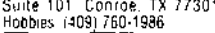
Hi-Tech Hobbies & Raceway, 1107 Port Neches Ave., Port Neches, TX 77651, (409) 724-7315

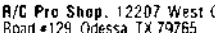

Indy R/C World, 220 Mesquite Village, Mesquite, TX 75150, (214) 686-7744


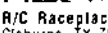
J&K Speedway, 201 Enterprise Row, Suite 101, Conroe, TX 77301, J&K Hobbies, (409) 760-1986


R/C Pro Shop, 12207 West County Road #129, Odessa, TX 79765

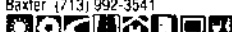

R/C Raceplace, 3546-A N. Main, Cleburne, TX 76031, Bruce Myers or Linda Achorn, (817) 558-2422


Randy's Hurricane Speedway, 9600-B Old Katy Rd., Houston, TX 77055, Randy Menchew, (713) 464-8020


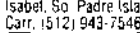
Rebel Hobbies & Raceways, 11925 Jones Maltzberger, San Antonio, TX 78216, George Norris, (210) 496-2396, fax, (210) 496-3294


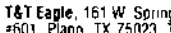
Rivercity Speedway, 11731 Wetmore, San Antonio, TX 78247, Ralph Hernandez, (210) 359-6870, Joe Toledo, (210) 341-5652


Ron's R/C Hobbies & Raceway, 2551 Lombardy, Dallas, TX 75220, Ron Salsini, (214) 357-3453


Southside R/C Raceway, 4409 FM2351, Friendswood, TX 77546, Roy Baxter, (713) 992-3541


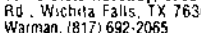
Spring Creek R/C, 45 Fisherman's Rd., San Angelo, TX 76904, (915) 944-3850

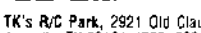

Star R/C Hobbies, 803 Garcia St., Port Isabel, So. Padre Island, TX 78578, Fred Carr, (512) 943-7546


T&T Eagle, 161 W. Spring Creek Pkwy., #601, Plano, TX 75023, Tony Welborn, (214) 517-0562


Texas Speedway, 6707 Chimney Rock, Houston, TX 77029, I&I Hobby Center, (713) 661-7137

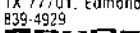

Texas State Raceway, 3703 Seymour Rd., Wichita Falls, TX 76709, Chip Warman, (817) 692-2065


TK's R/C Park, 2921 Old Claude Hwy., Amarillo, TX 79101, (806) 622-0017


Ty's Toys & Raceway, 129 John Stockbauer, Victoria, TX 77901, Ty Dorsey, (512) 575-6154


Was Hobby, 980 S. 4th St., Beaumont, TX 77701, Edmond Richards, (409) 839-4929

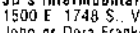

Wild Bill's, 535 E. Shady Grove, Irving, TX 75060, Lynn Morgan or Jerry Williams, (214) 438-9224


Z Track, 1550 Dunnam Dr., Abilene, TX 79602, Chi Chi, (915) 692-8477


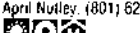
UTAH

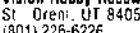
Hansen Intermountain R/C Raceway, 8481 W. 2700 S., Magna, UT 84044, Kevin Hansen, (801) 250-8303


High Anxiety, 271 N. Donlee Dr., St. George, UT 84770, (801) 673-9331

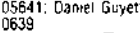

JD's Intermountain R/C Raceway, 1500 E. 1748 S., Vernal, UT 84078, John or Dora Frankovich, (801) 789-9930 or 789-8337


Power Hobbies & Raceway, 135 No. 900 East Suite 7, St. George, UT 84770, April Nutley, (801) 628-8747


Vision Hobby Raceway, 3528 N. State St., Orem, UT 84057, Vision Hobby, (801) 226-6226


WOR (Wasatch Off-Road Raceway), 3170 Brinker Ave., Ogden, UT 84401, Ultimate Hobbies, (801) 733-0933


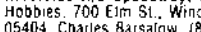
VERMONT

Barre Town R/C Club, Wall St. Complex, S. Main St., Rt. 14, Barre, VT 05641, Daniel Guyette Sr., (802) 229-0639


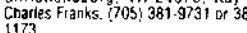
Green Mountain Superspeedway & Hobbies, Elm St., Winooski, VT 05404, Charles Barsalow, (802) 893-2660

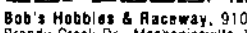

Hard Rock Raceway, Astrachan Dr., Bennington, VT 05201, Darren Ricchi, (802) 447-2656


Mike's Hobbies & Raceway, 162 N. Main St., Rutland, VT 05701, Stephen Rachis, (802) 775-0059


Riverside R/C Speedway, Boyz R/C Hobbies, 700 Elm St., Winooski, VT 05404, Charles Barsalow, (802) 893-2660 or 893-2332


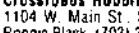
VIRGINIA

A-1 Raceways, 940 Radford Rd., Christiansburg, VA 24073, Kay or Charles Franks, (703) 381-9731 or 382-1173


Bob's Hobbies & Raceway, 910-J Brandy Creek Dr., Mechanicsville, VA 23111, Bob Wagner, (804) 746-2758


Cooper's R/C Raceway, Rt. 4, Box 12203, Chatham, VA 24531, (804) 724-4182

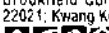

Crossroads Hobbies R/C Raceway, 1104 W. Main St., Salem, VA 24153, Ronnie Black, (703) 387-3414

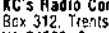

Front Royal R/C Racing Association, P.O. Box 1252, Front Royal, VA 22630, Pete Pomeroy, (703) 636-6149


H&S R/C Raceway, 565 Electric Rd., Salem, VA 24153, Henry Dowd or Stacy LaPrade, (703) 343-4012


Hobby Hangar Speedway, 4433A Brookfield Corp. Dr., Chantilly, VA 22021, Kwang Ko, (703) 631-8820

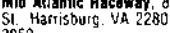

KC's Radio Control & Repair, Rt. 4, Box 312, Trents Ferry Rd., Lynchburg, VA 24503, Curtis or Kim Wright, (804) 384-8596


Lane's End Raceway, P.O. Box 153, Bridgewater, VA 22801, Tony Strother, (703) 828-6655 or 3471


Mid Atlantic Raceway, 89 E. Elizabeth St., Harrisburg, VA 22801, (703) 433-3952


NSWC MWR R/C Track, C1243C Dahlgren, VA 22448, Doris Copen, (703) 563-1730


SHAMROC, P.O. Box 3739, Winchester, VA 22604, Glenn Bland, (703) 888-3927


Sterling Truck & Auto Racers, 20921 Davenport Dr., Sterling, VA 22170, Ron Beckman, (703) 444-0333


The Tillyard, Rt. 1, Box 235A, Dayton, VA 22801, Homer W. Allman Jr., (703) 828-3471 or 828-5655


Trainland R/C Club, 5651 Shoulders Hill Rd., Suffolk, VA 23435, Frank Stevens, (804) 483-2331


Winners Circle, 3236 W. Clay St., Richmond, VA 23230, (804) 355-7076


WASHINGTON

Alto's, 108 South K St., Aberdeen, WA 98520, (206) 533-6638


Arlington Heights Speedway, 13629
228th St. NE, Arlington, WA 98223
Shawn Bussert (206) 435-3442



Firgrove TNT Raceway, 10611 136th
E, Puyallup, WA 98374, Walli Hale,
(206) 845-7675



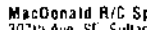
Four Season R/C Racing, 2941 Sleater
Kinney Rd. NE, Olympia, WA 98506
Gary & Sharon Brown (206) 491-2430



Hank Perry Race Complex, Sullivan
Rd. WA 98213 (509) 927-1879



L&L R/C Raceway, 15818 SE 287th,
Kent, WA 98042, Eric Lake or Bob
Lewis (206) 639-1241 or 631-1664



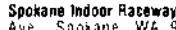
MacDonald R/C Speedway, 12822
307th Ave. SE, Sultan, WA 98294 Brent
MacDonald (206) 793-1886



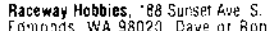
NDRA Performance R/C, P.O. Box 955
1673 Cedarlane Rd. E, Mt. Vernon, WA
98273 (206) 755-9464



Schmidt's Auto Parts, 10305 Old Hwy.,
99 Marysville, WA 98271, Jon Failla,
(206) 653-8838



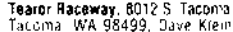
Spokane Indoor Raceway, E 6422 2nd
Ave., Spokane, WA 99212, Mike
Gjendem, (509) 534-RACE



Raceway Hobbies, 188 Sunset Ave. S.,
Edmonds, WA 98020, Dave or Ron
Steen, (206) 774-3265



Tacoma R/C Raceway Hobbies, 6305
6th Ave., Tacoma, WA 98406, (206)
565-1935



Tearor Raceway, 8012 S. Tacoma Way
Tacoma, WA 98499, Dave Kleinman
(206) 584-8659



WEST VIRGINIA

Burr-Fab Raceway, 90 Davis St., West
Union, WV 26456, Mark Travis, (304)
873-2487



Fairmont R/C Raceway, 430 Fairmont
St., Fairmont, WV 26554, Ed Kirby,
(304) 363-5509



Fulton's R/C Raceway, 2646 Chapline
St., Wheeling, WV 26003, James
Fulton, (304) 233-5355



R/C Race Place, Rt. 10, Box 351,
Morgantown, WV 26505 (304) 292-
0811



R/C Speed, Rt. 1, Box 365, Ronciverte,
WV 24970, Joe (304) 647-4162



WISCONSIN

ABC R/C, 1441 E. East Main St.,
Waukegan, WI 53186, Dick (414) 542-
1245



Antigo Hobby, 311 Superior St., Suite
7, Antigo, WI 54409 (715) 623-7655



Arena Park Raceway, Kenosha County
Parks, 7727 80th Ave., Kenosha, WI
53142, David Delabio (414) 657-6371



Fox Valley Off-Road Racing Club, Rt.
Mayflower Rd., Hortonville, WI 54944
(414) 739-9211



Frog's R/C Raceway, Rt. 1, Phillips, WI
54555, (715) 339-2314 or 339-2958



Gary's Hobby Center, 3701 Durand
Ave., Racine, WI 53403, Ron, (414)
554-8884 or 1-800-894-6229



Grant County Speedway, 2125 Oak,
Hazel Green, WI 53811, Brad Birkette,
(608) 854-2246



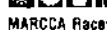
Hobbytown Speedway, 4231 8th St. S.,
Wisconsin Rapids, WI 54494, (715)
421-1222



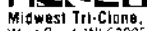
JJ's Dirt Heaven, 6028 County K,
Champion, WI 54229, (414) 866-9096



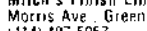
Maniac Motors Raceway, 244 Rt. 1 A1
Rt. H, Kendall, WI 54638, (608) 462-
8935



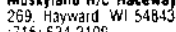
MARCCA Raceways, 1810 S. Park St.,
Madison, WI 53713, Jeff Gundlach,
(608) 273-0519



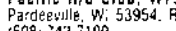
Midwest Tri-Clone, 144 N. Main St.,
West Bend, WI 53095, (414) 334-0487



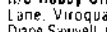
Mitch's Finish Line R/C Inc., 786
Morris Ave., Green Bay, WI 54304,
(414) 497-5057



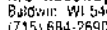
Muskyland R/C Raceway, Rt. 10, Box
269, Hayward, WI 54843, Jim Ahrens,
(715) 634-2108



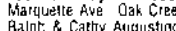
Pacific R/C Club, W7990 Hwy. P,
Pardeeville, WI 53954, Rhys Brenner,
(608) 742-7100



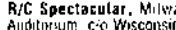
R/C Hobby Off-Road Track, Lewison
Lane, Virroqua, WI 54665, Dan and
Diane Sawwell (608) 637-8221



R/C Raceway, 2239 Cty. Rd. E.,
Baldwin, WI 54002, Lance Van Damme,
(715) 684-2690



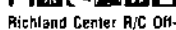
R/C Raceways & Hobbies, 181 W.
Marquette Ave., Oak Creek, WI 53154,
Ralph & Cathy Augustino, (414) 764-
9701



R/C Spectacular, Milwaukee Mecca
Auditorium c/o Wisconsin Motorsports
Show, 11020 W. Rogers, Milwaukee
WI 53227, (414) 327-3999



Radio Mania, 129 Harrison St., North
Prairie, WI 53153, Bill Bowes, (414)
392-9515



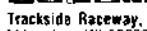
**Richland Center R/C Off-Road Racing
Club**, Fairground Rd., Richland Center,
WI 53581, Rick & Cheryl Slussy, (608)
647-7313



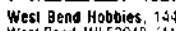
Sparta R/C Raceway, Golf Course Rd.,
Sparta, WI 54656, Eric Johnson, (608)
269-5861 or 269-6613



Stollz Raceways, 548 Summit Dr.
West Bend, WI 53095, (414) 338-6097



Trackside Raceway, 4405 W. Bradley,
Milwaukee, WI 53223, Joel Gish, (414)
355-1910

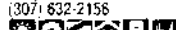


West Bend Hobbies, 144 N. Main St.,
West Bend, WI 53040, (414) 334-0487



WYOMING

**Collectable Creations Off-Road Oval
Track**, 1790 Dell Range Blvd.,
Cheyenne, WY 82009 Phil Severson
(307) 632-2158



AUSTRALIA

Wodonga R/C Car Club, 11 Murphy St.,
Wodonga, VIC 3690 Ron Langman,
011-6160-247-128



Aubry R/C Car Club, Aubry
Showgrounds, Aubry, NSW 2640, Ron
Langman, 060-247-128



BRAZIL

Hobby Center, SQS 210 B/H Apt. 204,
Brasilia, DF-Bras 170 273, 061-242-
0488



Off Roaders, Av. Guilherme Dumont
Villars, 317, Sao Paulo, CEP 05640,
Waldir Iepio, (055) 011-260-5628, fax
(055) 011-831-4931



Way of R/C Off-Road Cerrado, Rua
Fernandes Tourinho 999 4th Floor, Belo
Horizonte, MG Claudio Teodoro Correa,
(55) 31-223-3676



CANADA

Andy's R/C Raceway, Box 423, Lac La
Biche, AB T0A 2C0 Andy Bryks, (403)
623-2951



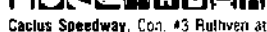
Aprilia Track, 20 Parsons Ridge,
Kanata, Ontario K2L 2N4 (613) 856-
2577



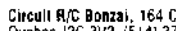
ATN, 2000 Paul Hubert, Nicolet, Quebec
J0G 1E0, Louis Durand, (819) 293-6097



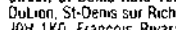
Autodrome des Prairies, 935 Boul. St-
Luc, St-Luc, Quebec J3J 2A0, (514)
348-0718



Calculus Speedway, Con. #3 Ruthven at
Colasanti's, Ruthven, Ontario N9N
2W6, Lanny Fitzpatrick, (519) 735-
3039, Wayne Telasco, (519) 966-0702



Circuit R/C Bonzai, 164 Cowie, Granby,
Quebec J2G 3V3, (514) 372-3622



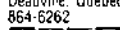
Circuit St-Denis Auto Téléguides, 292
DuLion, St-Denis sur Richelieu, Quebec,
J0H 1K0, Francois Rnard, (514) 787-
1127



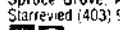
Circuit Teleguide Ville Mercier, 1101
St. Jean Baptiste, Mercier, Quebec J6R
1C6, Norm Foster, (514) 699-4003



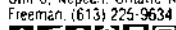
Club AVATT, 244, rue Hotel de Ville,
Deauville, Quebec, Daniel Vanier, (819)
864-6262



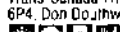
Crash Course, Box 9, Site 8, RR #1,
Spruce Grove, Alberta T7X 2T4, Tim
Starved (403) 963-5795



Dynamic Hobbies, 21 Concourse Gate,
Unit 6, Nepean, Ontario K2E 7S4, Clark
Freeman, (613) 225-9634



The Glass Castle Off-Road, RR#7
Trans Canada Hwy., Duncan, B.C. V9L
6P4, Don Douthwright, (604) 746-6518



GRSCR, 9 Gauthier, St-de L'Achigan,
Quebec J0K 3H0, (514) 588-4254



Honda House Motor Speedway, 384
Richmond St., Chatham, Ontario N7M
1P9, John Elliot, (519) 354-5530



Interior R/C Racers, 311-1780
Springview Pl., Kamloops, BC, V2E 1J4,
Martin Vannieuwenhuizen, (604) 374-
1268



IRCCC OH-Road, Harland Rd., Victoria,
B.C., Gary Allen, (604) 478-8004



Ivan's Playground, 2220 Dewdney
Ave., Regina, Sask., S4R 1N3, Ivan or
Conrad, (306) 757-8881



J-T International Raceway, 127
Milligan Lane, Nananee, Ontario K7R
8A1, N. D. Neill, (613) 354-0099



Kamloops Dirt Burners, 311-1780
Springview Pl., Kamloops, BC, V2E 1J4,
Martin Vannieuwenhuizen, (604) 374-
1268



Kiwanis Radio Control Club, 410
Spruce St., Timmins, Ontario P4N 4S7,
Al Bouley, (705) 267-1569, fax, (705)
268-9129



Krazy Trak, 2412 Miller Ave.,
Saskatoon, Sask., Brian & Bart Kengel,
(306) 221-7344



Mackay Track, 1025 W. 14th, North
Vancouver, BC, Alan Walrond, (604)
684-8335



Maple Grove R/C Track, RR #3
Brookville, Ontario K6V 5T3, Ray
Giroux, (613) 342-5549



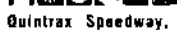
MORRAC Raceway, 6449 Crowchild Tr.
SW, Box 36060, Calgary, Alberta T3E
7C8, Gary Fliegel, (403) 254-1386



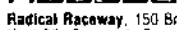
Niagra R/C Speedway, 1874 Hwy 20,
Thorold, Ontario, Steve Ingram (416)
892-5548



**Northern Alberta Scale Car Auto
Racers**, 1142 Knottwood Rd. E.,
Edmonton, Alberta, T6K 2J8, Dean
Simpson, (403) 461-3432



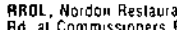
Quintrax Speedway, Box 1034,
Bellefonte, Ontario K8N 5B6, (613) 962-
1414, fax (613) 962-7306



Radical Raceway, 150 Bradwick Drive,
Unit 25, Concord, Ontario L4K 1K8,
Roland Glass, (416) 660-5238



Rousillon Hobby Track, 177-D St-Jean
Baptiste, Chateauguay, Quebec J6K
3B4, (514) 698-2151



RR01, Nordon Restaurant, Hamilton
Rd. at Commissioners Rd., London,
Ontario, Mark Hennon, (519) 457-2758



Seaway Valley R/C Raceway, RR 1,
Iroquois, Ontario K0E 1X0, Orville or
Carol Smyth, (613) 652-4953



Thunder Alley, 1380 London Rd.,
Sarnia, Ontario N7S 1P8, Rob Smith,
(519) 882-3361



Top Qualifier Race Club, McKay Park,
North Vancouver, B.C., Derrick
Vandekraats, (604) 985-3948



Union Creek Speedway, 281
Henderson Highway, Winnipeg,
Manitoba R2L 1M4, MACAR c/o Kelvin
Community Centre, (204) 667-9186



Universal R/C Speedway, Niagara St.,
Welland, Ontario, (416) 735-5051



West Coast R/C Raceway, 190-7771
Alderbridge Way, Vancouver, B.C. V5C
3A3, Michael Ma or Kelly Ho (604)
276-8779



WORRC, 861 Isack Dr., Windsor,
Ontario N8S 3W6, Pete Adams (519)
944-8519 or 974-3346



Woodstock Speedway, Queen St.,
Woodstock, NB, Woodstock Hobby
(506) 325-2067



DENMARK

Rainbow Raceway, Eriksvej 9
Glostrup, Copenhagen 2600 P
Christiansen, 011-45-52-848-504



FRANCE

Auto Electron, 35, rue B. de Ventadour
Lirmoges, France 87030, M. Boudoul 55
052763



HONDURAS

Autodromo Accion, Quinta Santa Maria,
San Pedro Sula, Honduras, Colonia
Rivera Hernandez, Eduardo Mondel
(504) 52-2051



HONG KONG

Kingsville's Rallyland, Wong Chuk
Yeung Village, Fo Tan, N.T. Pak Cheung
(852) 807-0828



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Off-Road Worlds Preview

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Traxxas TRX-3

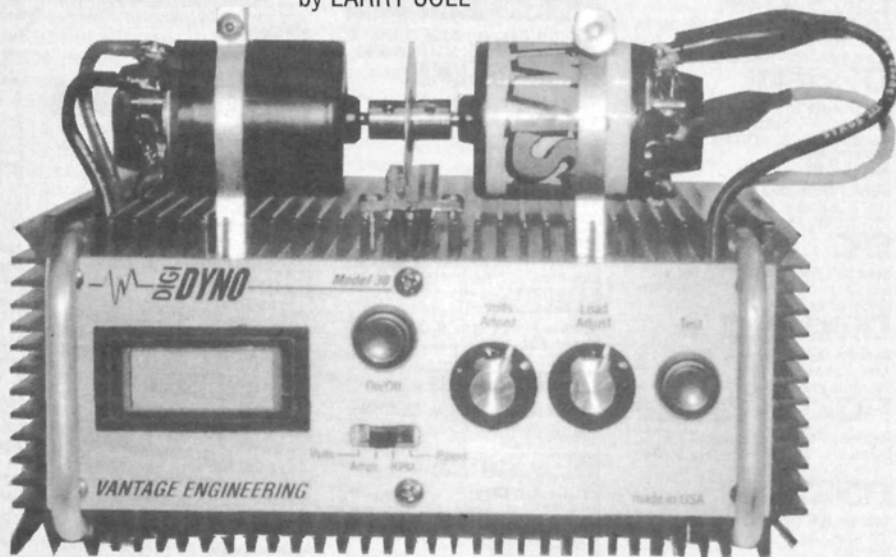
MRC **Desert Baja Rat King**



VANTAGE ENGINEERING

Digi-Dyno

by LARRY COLE



FOR SOME R/C car racers, what was once a hobby has grown into a full-blown sport. This transition hasn't been easy, however; the faster you want to go, the more money you'll spend. With the never-ending quest for speed in mind, R/C car and equipment manufacturers have turned to high-tech approaches—from computerized battery-charging systems to motor dynos. The latest player in the dyno game is Vantage* Engineering and its Digi Dyno 30.

The Digi-Dyno 30 from Vantage Engineering features variable amp and voltage adjustment and an optical rpm sensor for accurate and consistent readings. A finned-aluminum case keeps the unit cool.

SPREADIN' THE LOAD

The Digi Dyno 30 is a high-tech, high-end unit that's designed to tune motors for maximum performance. It has the following features:

- variable-load adjustment that allows the test motor to draw up to 30 amps—one of the highest amp ratings on the market;
- an optical sensor for precise measurement of test-motor rpm;
- a voltage adjustment range between 2.5 and 7.4V. (To simulate 4-cell racing, use a voltage setting of 4.4V. Set the unit to 7.2V to tune off-road motors.)
- a 28-turn slave motor that has been specially designed for the Digi Dyno to provide the most consistent readings possible;

- aluminum motor clamps with a built-in thumbscrew so that the slave motor and the test motor can be held securely to the unit for the most accurate, consistent readings;
- a stand so that the dyno can be set at an angle, making it easy to read the dials and the LCD display.

POWER CHOICES

These are your power options: two 6-cell Ni-Cd packs, a 12V automotive or marine battery, or a 12V power supply rated at 30 amps or more. I recommend the 30A power supply; I found it difficult to achieve a 30A power draw from the Ni-Cd packs and the car battery. This baby really like the juice!

The Digi Dyno lets you monitor a motor's performance by determining its power, or wattage, output. Since wattage is the electrical equivalent of horsepower (1hp = 746W), the Digi Dyno reads this wattage so that you can pick the motor that meets your requirements, e.g., a more efficient motor might be best for on-road rac-

The key to warp speed

ing, while a less efficient motor that has more torque might be better suited for truck racing.

WATT IT ALL MEANS

When the slide switch is in the power position and you push the test button, you get the motor's power reading in watts for any load up to 30 amps. By sliding the switch to the rpm mode, you can also determine the motor's rpm. With this data, you can figure out the motor's relative torque by using the following formula:

$$\text{Torque} = (\text{hp/rpm}) \times K$$

K is the correction factor of units of measure such as newton-meters or ounce-inches.

Using several different amp-draw settings allows racers to monitor their motor's power curve, rpm and general performance over a wide range of amp draw.

Let's say that you've dyno'd a stock motor and you get the following readings at 20 amps:

$$\begin{aligned} \text{rpm} &= 14,000 \\ \text{power reading} &= 64 \end{aligned}$$

Using the formula that I discussed earlier, you can figure out the relative horsepower. (Remember, 1hp = 746.) Divide the power reading by 746. Therefore, the formula would read:

$$64 \text{ watts} = 64/746, \text{ which equals } .085 \text{ hp}$$

Now that you have the horsepower reading, you can calculate the motor's torque:

$$\text{Torque} = .085 (\text{your hp calculation}) \text{ divided by } 14,000 (\text{your rpm reading}) \text{ which equals } .0000607.$$

Multiply this by whatever K factor you use, i.e., to convert it into newton meters or ounce-inches. I prefer to use the "Cole factor," by simply dropping the leading zeros, thereby giving me a cleaner number of 607. Using this formula, you can compare this motor with the next one you test, enabling you to pick the better of the two, or you can use the number to compare to after the motor has been run or after you try a different brush/spring combination. You can also use the number to determine the effects of changes made to motor brushes, springs, timing, etc. Here's another simple rule to remember that will help keep your calculator in your toolbox more than in your hands: given two motors with the same power reading, assume that one motor has more torque than the other if the rpm reading is lower. Conversely, if the rpm reading is higher, it will have less torque.

VANTAGE ADVANTAGE

No electrical tomfoolery here! The instructions are well-written and easy to understand—even for a non-electrical guru like me. Complaints?—just one. The manufacturers should have included a carrying case for the Digi Dyno. [Editor's note: *Vantage Engineering will have an optional carrying case for its Digi-Dyno available by the time this article is published.*] Here's the bottom line, folks: if you're in the market for a dyno; if you want the most for your money; and if you want to invest in a quality item that's still

made in America, then the Vantage Digi Dyno 30 has the "ad-vantage"!

**Here's the address of the company featured in this article:*
Vantage Engineering, 681 Main St., Waltham, MA 02154. ■



A four-position slide-switch is used to gather all pertinent data. You can set the amount of volts at which the test motor runs, and you can vary the amount of load (in amps) that the slave motor places on the test motor.

*p*oint blank™ Is now available from the following R/C dealers

- | | |
|---|---|
| FRANKS HOBBY HOUSE
PHOENIX, AZ
602-992-3495 | R/C PRO SHOP
ST. PAUL, MN
612-772-1863 |
| THE HOBBY PLACE
LOS ANGELES, CA
310-836-2000 | CHECKERED FLAG
ST. LOUIS, MO
314-892-5353 |
| CLAYTONS HOBBIES
NORTH HAVEN, CT
203-234-2529 | BIR HOBBY SHOP
ELIZABETH, NJ
908-352-6955 |
| KENNEDYS HOBBIES
MILLSBORO, DE
302-934-1708 | HOBBY HEAVEN
CRANFORD, NJ
908-272-7660 |
| MITCHELLS FAMILY STORE
WILMINGTON, DE
302-652-3258 | MOTOR BIKE IMPORTS
PENNSAUKEN, NJ
609-662-6110 |
| THE PIT STOP
NEW CASTLE, DE
302-322-7970 | A & S RACE CENTER
FULTON, NY
315-598-2772 |
| CENTRAL FLA. HOBBIES
ORLANDO, FL
407-295-9256 | BROCKPORT SPEEDWAY
BROCKPORT, NY
716-637-6224 |
| FAMILY HOBBY
NORTH NAPLES, FL
813-261-8545 | D & B HOBBIES
ODESSA, NY
607-594-3447 |
| SANDY FLEMING FAST ELEC-TRICKS
PEARL CITY, HI
808-456-7272 | PERFORMANCE HOBBIES
W. ROCHESTER, NY
716-872-4990 |
| THE TOY CONNECTION
HONOLULU, HI
808-533-4629 | QUEENS OFF ROADERS
LONG ISLAND CITY, NY
718-392-5766 |
| ALL HOBBIES
CHATTANOOGA, IL
615-894-8883 | WALTS HOBBIES
SYRACUSE, NY
315-453-2291 |
| ORLAND HOBBIES
LOMBARD, IL
708-953-8447 | GOLDEN BEAR HOBBIES
ORRVILLE, OH
216-683-1250 |
| ORLAND HOBBIES
TINLEY PARK, IL
708-429-9911 | STRONGSVILLE HOBBIES
STRONGSVILLE, OH
216-572-0430 |
| WORLD HOBBIES
WEST DUNDEE, IL
708-428-4380 | WINGS & THINGS
TULSA, OK
918-745-0034 |
| BOX CAR HOBBIES
CEDAR RAPIDS, IA
319-362-1291 | DREAMBOAT MARINE
WARREN, PA
814-723-8052 |
| HOBBY CRAFT SHOP
BURLINGTON, IA
319-754-4979 | HENNING SCALE MODELS
LANSDALE, PA
215-368-4687 |
| MARBLES HOBBY SUPPLY
DES MOINES, IA
515-262-7507 | NEW GARDEN FARMS
KENNETT SQUARE, PA
215-444-1850 |
| RC HANGAR
MARION, IA
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EASTON, PA
215-253-8850 |
| LEXINGTON MODEL
LEXINGTON, KY
606-293-2951 | RC HOBBIES
COVENTRY, RI
401-823-4335 |
| DIRT SLINGERS
SODUS, MI
616-927-1431 | ACTION HOBBY SHOP
MEMPHIS, TN
901-365-4345 |
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BIG RAPIDS, MI
616-796-3217 | HANSEN INTERMOUNTAIN
MAGNA, UT
801-250-8303 |
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206-533-6638 |
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| RIDERS HOBBIES
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MILWAUKEE, WI
414-355-1910 | RANGE RACING WORLD
EVELETH, WI
218-744-4423 |
| | HOBBY MASTERS
EAU CLAIRE, WI
715-835-5004 |

MRC DESERT THUNDER

(Continued from page 57)

the electronics were on board, several other racers had shown up to practice. It was only a matter of time before they were wrapped around my pit area in a state of awe. I couldn't believe how well-informed they all were about World Scale off-road! (No doubt, they were all *Car Action* subscribers.)

I dropped in a freshly peaked, 7-cell, 1400 SCR battery pack (and a fully charged receiver pack!) and went back at it. The Tekin* ESC, the Peak Performance* motors, and the bearings really brought the Desert Thunder to life. I particularly noticed the abundance of low-end torque, which gave the car tremendous off-the-line acceleration and out-of-the-corners "punch." I also noticed that the ESC and the motors were barely warm, even after several battery packs.

Before I knew it, a 1/10-scale truck and a 1/10-scale buggy were on my tail. The Desert Thunder was so stable that I just "drew a line" and stayed on it. The 1/10-scalers had enough top end to leave me in a cloud of dust, but they never had an opportunity to do so because they were too busy crashing.

At one point, the 1/10-scale truck rammed right into the Desert Thunder, and it went into a very impressive quadruple somersault, but the Desert Thunder didn't even budge! The driver of the truck turned to me and said, "Why don't you pick on somebody your own size?" That comment became the theme of this article, and I think it sums up the Desert Thunder's capabilities quite well.

After a dozen or so runs, it was time to go home. Other than a few scratches on Richard Muise's paint job, the Desert Thunder made it through the "Speedy Gonzalez" torture test without even popping a tie rod.

FINAL IMPRESSIONS

The Desert Thunder is a solid performer. It's as much fun to watch as it is to drive. In stock configuration, it might not have the top speed or run times of a 1/10-scale off-road racing car, but it makes up for those inadequacies in many other areas of performance. The Desert Thunder is more stable and easier to drive than any 1/10-scale off-road car I've ever driven.

So, is bigger really better? In many ways, it is. One thing is for sure: the Desert Thunder will leave first-time racers with a positive impression of R/C racing and give even the most experienced racers an entirely new driving experience.

*Here are the addresses of the companies mentioned in this article:

MRC, 200 Carter Dr., Edison, NJ 08817; (908) 248-0400.
Motion Graphics, 2645 Robert Arthur Rd., Westminster, MD 21157; (410) 848-0008.
Associated Electrics Inc., 3585 Cadillac Ave., Costa Mesa, CA 92626; (714) 850-9342.
Tekin Electronics, 940 Calle Negocio, #140, San Clemente, CA 92673; (714) 366-9016.

Peak Performance, 1362 E. Edinger, Bldg. B, Santa Ana, CA 92705; (714) 667-6865.
Airtronics Inc., 11 Autry, Irvine, CA; (714) 830-8769. ■

DURATRAX LX-T

(Continued from page 65)

the dirt. If the bottom was smooth, it would be no problemo, but the four motor mounts snag the ground. This slows the truck momentarily—until shock rebound lifts the chassis again. Flat-head screws wouldn't drag on the ground, but then again, the truck might vibrate too much to use countersunk flat-head screws.

WELCOME TO THE WORLD OF GAS

I'm still pretty shaky on carb tuning, cleaning the engine, glow-plug tech and the like, but I'm definitely a gas fiend now! The smell of the burning fuel and the sound of the screaming 2-stroke motor make me feel like I did when I first discovered girls, and the power of nitro can't be beat! When I'm styling the DuraTrax LX-T around our stadium-style track, I get an adrenaline rush like I did when I first started racing dirt bikes. I'm hooked!

The best part is that, with the LX-T suspension and handling, I'm not re-learning how to drive with the DuraTrax. The DuraTrax feels as planted in turns and as stable on rough straights as both of my electric LX-Ts, and it's carrying much more speed around the track! Another bonus is that, if you already have an LX-T (or RC10T), the conversion to gas is perfectly reasonable. The LX-T kit, with the CZ-R engine and the slide-valve carb, carries a suggested retail price of \$369.95 (most mail-order companies and hobby shops discount it to just under \$300). If you don't have an LX-T, the kit and conversion total \$699.90, plus another \$100 or so for the radio equipment and the receiver pack. Even if you're starting from scratch, the DuraTrax conversion is a great way to get into gas.

*Here are the addresses of the companies mentioned in this article:

DuraTrax, distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826; (217) 398-3630.
Team Losi, 13848 Magnolia Ave., Chino, CA 91710; (714) 465-9728.
Kyosho, distributed by Great Planes.
Paris Racing Products, 4254 Independence St., Chino, CA 91710.
Tecnacraft, 1335 E. Dayton St., Salinas, CA 93901; (408) 422-7466.
Pro-Line USA, P.O. Box 456, Beaumont, CA 92223; (714) 849-9781.
Futaba Corp. of America, 4 Studebaker, Irvine, CA 92718; (714) 455-9888.
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VOLTAGE DROP

PART 1...

Voltage drop multiplied by amperage is the amount of power that is unnecessarily **wasted** in the electrical system of your car. Getting power from the batteries to the motor with the least amount of voltage drop is one of the keys to going fast.

If your car has power wires that look like a **plate of spaghetti**, a bogus brand X speed control, and plugs that classify as fossils, then it's time to make some changes!

To get the most from your batteries, start with the best speed control you can get—a **Team Novak speed control!**

Next, set-up your car so that the power wires going from the batteries to the speed control and motor are as short as you can get them.

Keep in mind that long wires rob power from the batteries. **An 8 inch piece of wire has about the same voltage drop as the entire speed control!**

Shortening the wires to eliminate extra wire will reduce the voltage drop—which means **more speed and longer run times.**

Try measuring the total length of all of your wires with a ruler before and after you start cutting and rearranging. Every inch counts! Shorten the wires as much as possible without going so far that you cause problems like restricted suspension travel or making it more difficult to work on the car.

SHORT WIRES ARE FAST

Don't cut the wiring harnesses that go from the speed control to the receiver and the ON/OFF switch. Cutting them doesn't improve the voltage drop of the speed control, usually causes wiring mistakes, and will void the warranty.

And, if you're not comfortable with wiring, electronics, and soldering, it's probably a good idea to wait a while before you start making changes. Practice your driving and ask questions at the race track. Check out the fast guys cars and ask for some help dialing-in your car.

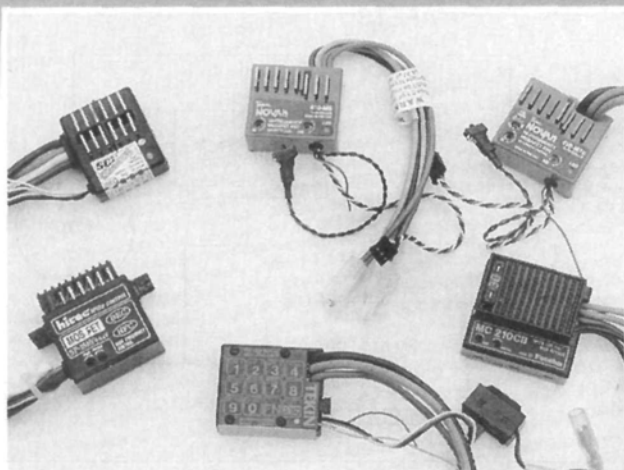
Keep those wires short... and go fast!

Look for **PART 2** next month!

Team Novak welcomes your comments and secrets!

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FET FACTS

Basics of Speed Controllers

YOU'RE THE proud owner of a new dirt-racing buggy, but your buddy still nails your ears back at your favorite off-road course. With the skill of a surgeon, he negotiates his car through turns and over jumps at just the right speeds. As it exits the final turn, it accelerates down the straight like a rocket sled. Your problem could be that your stock 2- to 3-speed mechanical speed controller just doesn't provide the control your car needs to negotiate challenging courses. The solution may be to use an electronic speed controller (ESC), but which one should you buy? With all the controllers on the market today, choosing one can be tricky. To make an informed decision, you have to probe the basics of ESCs.

RESISTANCE IS FUTILE

The most important ESC specification is "on" resistance—its efficiency rating. The lower the "on" resistance the better, because your car's run times will be longer and your controller will run cooler.

Some manufacturers cite resistance in ohms; others list it in volts. These are two ways of saying the same thing. Both are measured using a standard amount of current, usually 10 amps, and both are based on the formula: volts = current (in amps) x resistance (in ohms). We engineering types write this as $V = I \times R$. Here's an example: a manufacturer cites an ESC's "on" resistance as 0.003 ohm. To determine the voltage drop, simply plug this and the 10A figure into the formula: $10 \text{ amps} \times 0.003 \text{ ohm} = 0.03 \text{ volt}$.

WHAT MAKES AN ESC PERFORM?

What factors affect an ESC's "on" resistance? The first factor is style. Racing-style ESCs (forward-only with brakes) usually have lower "on" resistances than those with reverse.

HEAT

It's important to use heat sinks, because the cooler you keep the FETs, the lower your ESC's "on" resistance will be. The "on" resistance that's given in the specifications is determined when the FETs are at room temperature. As the temperature increases, so does the resistance. (Note that manufacturers usually cite how much the resistance will increase with each degree that the temperature rises.)

Heat sinks also prevent your ESC from being damaged—especially if it has automatic thermal shutdown. You can never be sure where the manufacturer has put the temperature-measuring device that shuts off the controller when it overheats. Heat sinks help to distribute heat evenly to all the FETs. This enables the heat sensor to sense disastrous heat levels—regardless of its location—and turn off the ESC.

Imagine finally making it to the head of the pack one hot summer's day only to have your controller die because it overheated. Heat sinks will help to prevent this from happening.

SINKS SINKS

by JOHN RIST

SPEED CONTROLLERS

Compare the diagram of the 7-FET (field-effect transistor) racing-style ESC (Figure 1) with that of the 10-FET ESC with forward, reverse and brakes (Figure 2). Although you might think that, because it has 10 FETs, the ESC in Figure 2 would have the lower "on" resistance, this isn't the case. Six of the racing controller's FETs are wired in parallel for forward; the seventh is for braking. If each FET has an "on" resistance of 0.009

THEM'S THE BRAKES

How the heck can an electric R/C car have brakes? It doesn't have rotors or drums, so what makes it stop? The motor acts as a brake when a load or short is placed across it and forces it to act as a generator. Generators convert mechanical energy to electrical energy. Since they require a lot of force to make them turn, the shorted motor stops the car's wheels from turning.

When you apply brakes, your car's motor converts the mechanical energy of the rotating wheels into electrical energy. This energy creates a strong magnetic field that greatly increases the motor's drag. Since the braking force is directly related to how much mechanical energy is applied to the motor, the faster your car is traveling, the greater the braking force will be.

The stronger a motor's magnets, the more current it generates during braking. When the brakes are applied, this current travels directly to the brake FET. Older ESCs often can't handle this increased load (they often "shut down" because of it), so it's important to use a heat sink on an ESC's brake FET.

Many manufacturers have doubled their ESC's braking power by adding another transistor to handle the braking current. Many racers also install a Schottky diode across their motors' positive and negative poles. During forward motion, the diode absorbs the voltage spikes generated by the motor, and this helps the brake FETs to absorb the current that's generated during braking. (Remember, FETs become less efficient as their temperature increases. This is what causes brake "fade.")

Even if you decide not to use a heat sink on your ESC's forward FETs, always use one on the brake FET(s). Follow this rule, and your car will stop on a dime every time.

RACING - STYLE SPEED CONTROLLER FORWARD—ONLY WITH BRAKE 7 FETS

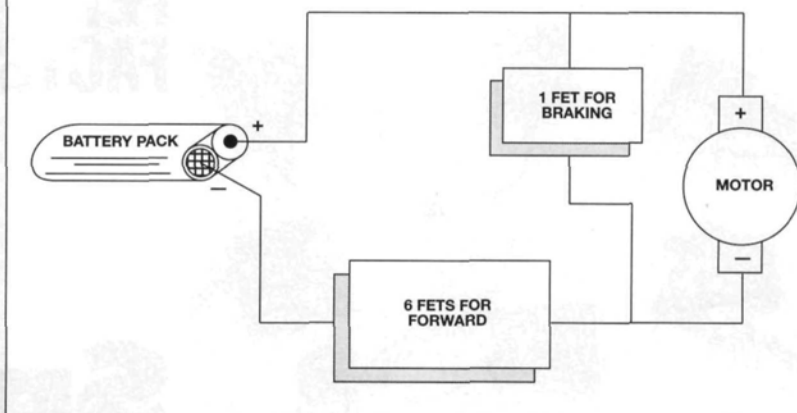


Figure 1

REVERSING - STYLE SPEED CONTROLLER FORWARD, REVERSE, AND BRAKE 10 FETS

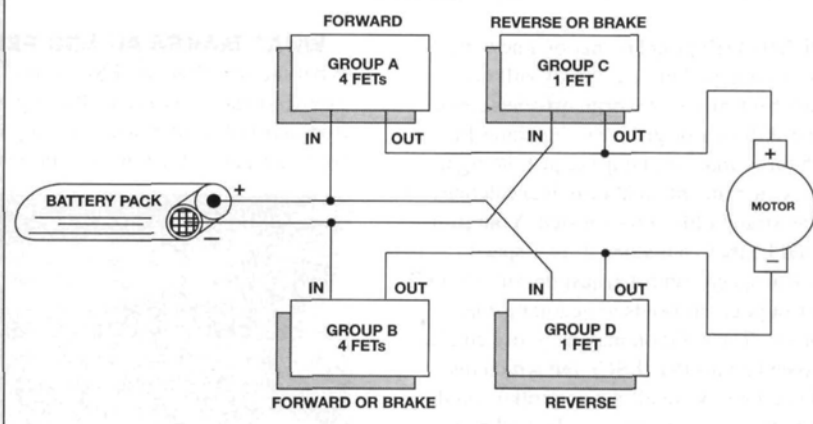


Figure 2

ELECTRONIC SPEED CONTROLLER MOTOR DRIVE WAVEFORM THROTTLE SET AT 70%

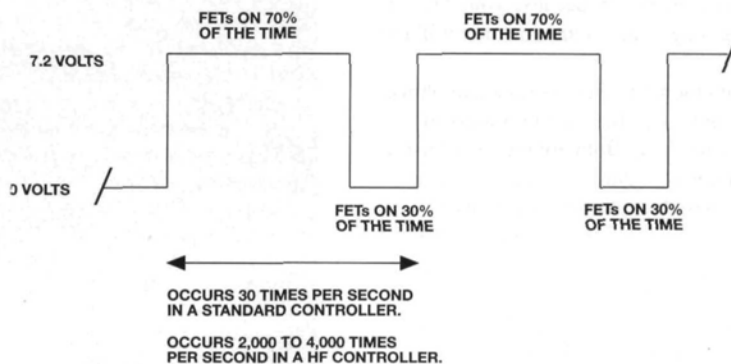


Figure 3

ohm, then the six FETs wired in parallel have a total resistance of 0.0015 ohm (0.009 divided by 6 = 0.0015). This translates to an acceptable voltage drop of 0.037 volt at a 25A level (the average current draw during a typical 4-minute off-road race.)

REVERSING YOUR COURSE

The FETs of the ESC in Figure 2 are divided into four groups. The two forward groups (A and B) each have four FETs. The two reverse groups (C and D) each have one FET. When the motor runs forward, groups A and B are

turned on. If you follow this path in the diagram, you'll see that the positive battery voltage is applied to the motor's positive lead, and the negative voltage is applied to its negative lead. When FET groups C and D are turned on, the positive battery voltage is applied to the motor's negative lead, and the negative voltage is applied to its positive lead. This causes the motor to run in reverse. (Note that when you apply brakes, FET groups B and C are turned on, and this places a short across the motor. For more info, see the sidebar on brakes.)

Each of the four FETs in group A has a resistance of 0.0248 ohm, so their total resistance is high—0.0062 ohm. To make matters worse, the group B FETs have the same total "on" resistance. Because both groups are in the path between the battery and the motor, the total resistance is 0.0124 ohm—a voltage drop of 0.31 volt at 25 amps. Compared with the racing ESC's 0.03 voltage drop, this is quite a difference in efficiency.

FET FACTS

"On" resistance is also affected by the quality of a unit's wires, connectors, and solder joints (see the sidebar on reducing resistance) and the quality and arrangement of its FETs. Some of you "sharpies" may have noticed that the FETs in the ESC with reverse have greater resistance than those in the racing ESC. Although they use more FETs, most ESCs with reverse cost less than racing units. To keep the cost low, most manufacturers use lower quality FETs in units with reverse. Even if both ESCs had FETs of the same quality, the racing unit would still have the lower "on" resistance owing to the arrangement of its FETs.

Enough about "on" resistance and all that boring math. The next characteristic that you should consider when you're shopping for an ESC is high-frequency motor control.

WHY HIGH-FREQUENCY?

As recently as three years ago, most ESCs had a motor-drive switching frequency of 60 times a second. At the '90 Toledo Exposition, just about all the major manufacturers introduced high-frequency motor control ESCs. These units boast switching frequencies that range from 2,500 to 3,000 times a second.

To understand what this means, you have to look at how an ESC controls the power that goes to the motor. In truth, an ESC is a switching regulator. If you set the throttle to the 70-percent point, the FETs will be turned on 70 percent of the time and off during the other 30 percent. In standard ESCs, this happens 60 times a second. In high-frequency

BUYING AN ESC.

WHAT

While you're looking for a killer controller, there are few things you should consider. These tips should help you to determine what your needs really are.

- **Intended use.** How will you use your ESC? For scale applications and "fun" running, it's best to use an ESC with reverse. Not only will it make your scale creation more realistic, but it will also be great for getting your car out of jams.

- **For racing, forward-only ESCs with brakes are the only way to go.** This is true for two reasons: most racing rules don't permit the use of controllers with reverse and racing-style units have much lower "on" resistance than those with reverse.

- **Voltage rating.** Match the controller's voltage rating to its intended use. If you plan to participate in "high-voltage" events such as drag racing, truck pulling, or insane runs, don't ask an ESC that's rated for 10 cells to support an 18-cell pack. The unit will go up in smoke! If you plan to race in a 6- or 7-cell class, on the other hand, remember that low-voltage FETs have lower "on" resistance than those with high voltage. An ESC that's rated for four to 10 cells would be a good choice.

- **On-resistance and switching rate.** Always choose an ESC with a low "on" resistance—the lowest that your budget will allow you to buy. Also, if you can afford it, invest in a high-frequency controller rather than a 60Hz switching unit. (Note: if the manufacturer's hype doesn't tell you that a unit is a high-frequency model, it probably switches at 60Hz.)

- **Sport models versus pro models.** The only major difference between sport models and pro models (aside from "on" resistance) is that sport models come with factory-installed connectors and pro models don't. (This allows serious racers to add high-quality, low-voltage-loss connectors or eliminate them by hard-wiring everything.) If you're a beginner, stick with a sport model. Hard-wiring an ESC incorrectly can seriously damage it—not funny stuff when you consider the cost of a good unit.

- **Special features.** Bells and whistles, e.g., programmable functions, current limiters, automatic thermal shutdown and reverse-voltage protection increase an ESC's cost as well as its capabilities. Of these features, automatic thermal shutdown and reverse-voltage protection are probably the most valuable because they prevent your unit from being damaged. Current limiters let you reduce acceleration without affecting top speed—just what you need if you race on slippery tracks or on those that are redesigned regularly. Programmable ESCs have "go-fast" features that are helpful to those with excellent driving skills. Although such units are good for advanced drivers who have large budgets, they're aren't absolutely necessary to win races.

- **Price.** It doesn't do any good to consider a controller that's out of your price range. Set a realistic upper limit, and then survey the market to see which ESCs you can afford. Don't forget to shop around. Most hobby products, including ESCs, are offered at discount prices.

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SPEED CONTROLLERS

units, it happens 2,500 to 3,000 times a second. (See Figure 3.)

Standard ESCs aren't as efficient as high-frequency units. The 60Hz-cycle rate is so slow that the motor "sees" the switching action. When the controller switches to full on, it tries to accelerate to full speed, and it draws a lot of current to support this acceleration. Just as the current starts to flow, the controller switches off, and the motor decelerates. The excessive current that flows during acceleration causes the motor to heat up.

High-frequency ESCs have several advantages over their slower counterparts. They provide silky-smooth throttle response, especially at low to moderate speeds. You

just barely squeeze the throttle, and the motor emits a high-pitched whine and turns smoothly—even at the lowest throttle setting. In addition, at higher switching frequencies, an ESC "averages" the current flow to the motor. This prevents the huge current rush that generates power-robbing heat in each 60Hz cycle.

The difference can be explained by examining the magnetic field that's caused by the current as it flows through the armature. When the FETs are turned on, a magnetic field is generated as the current rushes in. This field starts to collapse when the FETs are turned off. In a 60Hz controller, the magnetic field has time to collapse completely; in

a high-frequency unit, the field collapses only partially. Although any ESC—even a 60Hz unit—will provide much more control than a mechanical unit, those with high-frequency motor control offer many more advantages. Your motor runs cooler; throttle response is smoother (especially at slow to moderate speeds); and the motor brushes—and your run times!—last longer. One final thought: if you have an aggressive racing program in your area, go to the track and watch the winners. A peek into their cars should tell you what it takes to win. Just remember that to win in this sport, you need good driving skills just as much as you need good hardware. The only way to acquire the skills is to practice, practice and then practice more.

**Here are the addresses of the companies mentioned in this article:*

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REDUCED RESISTANCE

Before you throw out your old ESC because you think it's killing your chances of winning, there are a few things you can try.

First, you can improve an ESC's performance by shortening its battery leads. The easiest way to do this is to position your car's components carefully. I install my controller as close to the motor as possible, and I position the battery so that the ESC's leads will be as short as possible.

Also, the current that flows through your ESC passes through all the battery pack's connections—including the straps between the cells. Because of this, the quality of every solder joint and piece of wire in your car affects performance. Make sure that the joints are good, and use 12- to 14-gauge wire (the larger the wire, the less resistance it has).

You can also improve performance by eliminating or upgrading your ESC's connectors. To eliminate the motor connectors, I hard-wire (directly solder) my motor to the ESC's leads. For convenience, however, I use connectors on my battery packs.

The Tamiya-style connectors that come with most ESCs often become warm when I gear for a 4-minute dump. (In some of my tests, they've actually melted!) This tells me that they waste a lot of power, so I replace them with Litespeed* connectors. If you try these connectors, note that some types of motor spray eat their coverings. Also, be aware that they aren't polarized. Unless you lock the black and red connectors together to form a polarized pair, you could apply reverse voltage to your ESC and possibly damage it. You may also want to try Deans* new Ultra Plugs. (They're currently being shipped with Novak's* new pro-style ESCs, and they look like winners.) Any racing-style connector will do the trick as long as its resistance is low.

With careful planning, you can cut your ESC's "on" resistance in half. Remember, it's attention to detail that often wins races.

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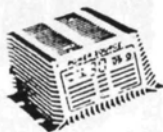
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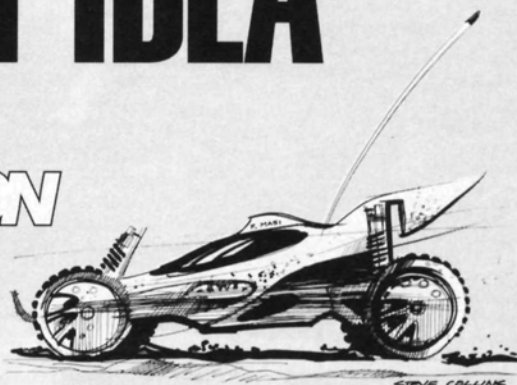


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NITRO NEWS

NOT JUST A PIPE DREAM

by JEFF BRONSTEIN

IT WAS THE eve of the main event and, after a final hotel-room car overhaul, I was just about to drop off to sleep. Suddenly, a familiar voice cut through my hazy half-consciousness. What kind of fantasy was I having? Could it be a beautiful blonde or a vivacious brunette? Then, visions of suspension springs, glow plugs and differentials coalesced into a shadow, a specter, an apparition of...of...Ron Paris in pink Bermuda shorts.

"Ron," I said. "What the heck are you doing in this dream? I gotta tell ya, I was hoping for Cindy Crawford, but the shorts are kickin'!" Confused as I was, I half expected to see Rod Serling emerge to recount the "Twilight Zone" intro.

"I'm here to reveal to you all the previously untold secrets about tuned pipes and exhaust systems," he said. I

was confused for a moment. But, what the heck, it's my dream, right? I think we were on a beach. Yeah, that's right, a tropical beach. Ron and I settled into our cabana chairs to discuss the finer details of tuned-pipe principles.

Ron casually sipped his piña colada and began to explain how a tuned pipe can improve the performance of a 2-stroke engine. "A pipe," he said, "improves the efficiency of the engine by allowing it to draw more of the

air/fuel mixture into the cylinder. Then, the pipe prevents unspent fuel from escaping into the exhaust by forcing it back into the cylinder before the piston closes off the port."

"But Ron, how does it do that?" (I actually knew the answer, but how else would this story go on if I didn't ask?) He said that the principle is based on the shape and

length of the pipe and the effect it has on the exhaust pulse. There are many subtle differences between pipes, but the basic designs are the same.

From the exhaust port, the first half of the pipe flares outward, like a megaphone. Without getting into a lot of physics mumbo-jumbo, the basic principle is that velocity and pressure are inversely proportional. The pipe's shape creates a low-pressure zone in its narrow portion (near the port), where the gases move rapidly. This low-pressure zone helps scavenge exhaust gases out of the chamber quickly, and it draws a larger charge of the air/fuel mixture through the intake ports for the next cycle. The low-pressure zone is regulated by the length of the section, and the angle of the flare.

In some cases, the low-pressure zone may be so effective that the unspent air/fuel mixture can be drawn through the chamber and into the exhaust before the port closes. If the unspent mixture is allowed to escape, it's wasted. To reduce the likelihood of this problem, the second half of the pipe tapers inward to create a rebounding high-pressure wave reversal, or "pulse-back," directed toward the exhaust port. This reflected pulse forces the unspent air/fuel mixture back into the chamber before the port closes, and it creates a very dense charge that reduces waste.

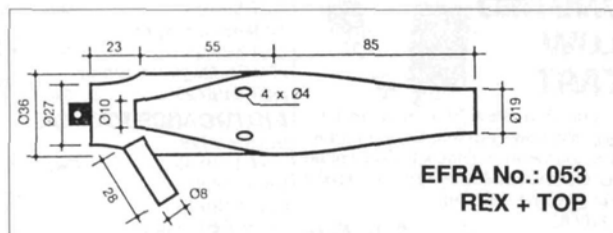
"Gosh, Ron, how does the pipe do that so fast each time the piston moves up and down? How do I know which pipes work best? And, most importantly, how did you get such a golden tan?" He pondered for a moment as he cracked a coconut. Basically, he said that the tan was easy; the other problems were more complicated.

The piston, he explained, opens and closes the exhaust port hundreds of times per second. Fortunately, the sonic pressure pulses move at the speed of sound. Therefore, the dimensions of the pipe are critical to proper engine perfor-

(Continued on page 136)



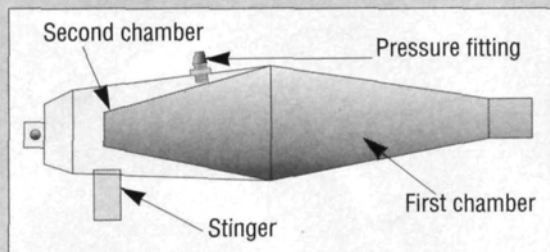
Tuned pipes come in many shapes and colors. The pipe dimensions, volume and angles determine its performance characteristics.



This TOP pipe no. 053 (EFRA number clearly stamped in the side) is the current rage with the Nova Rossi group. It works well with most engines, but it's particularly suited to the Ultra-Competition Nova Rossi TOP engine. It includes four fairly small radial holes between the chambers. It's mild in the low-end range, but it has phenomenal top-end. Note: these pipes are in short supply.



BASICS OF PIPE PARTS



Most pipes are actually quite simple in design, and all are made up of basically the same components.

■ **FIRST CHAMBER.** The first part of this chamber is cone-shaped to help scavenge exhaust gases from the engine quickly. To reduce the chances of unspent gases being drawn from the combustion chamber, the second part of the first chamber is tapered inward. Older pipes were made only of this first chamber and a stinger.

■ SECOND CHAMBER.

The second chamber captures the exhaust gases from the first chamber and vents them through the stinger. Two-chamber pipes are quieter than single-chamber pipes, but they're more expensive to manufacture.

■ **STINGER.** The stinger is just a vent tube in the pipe through which exhaust gases exit. For optimum performance, it's best that the stinger isn't obstructed by the car's body.

■ **PRESSURE FITTING.** Usually placed where the pipe's diameter is its largest, the pressure fitting provides a way to pressurize your car's fuel tank. Some racers prefer to place the fitting on the second chamber where there's less pressure, but it's more consistent.

mance. Measured from the glow plug to the end of the second taper, pipe length determines the timing, or the rhythm, of the pulse. Once the pipe dimensions are fixed, the pipe can optimize only a narrow range of rpm.

There are pipes that work particularly well for specific performance bands. Some improve low-end torque, and others enhance the upper mid-range and top end. Now and then, some manufacturers include specific recommendations for their pipes.

But, as a general rule, shorter pipes enhance the mid- to high-end range and longer pipes enhance the low-end range. The length, or "frequency," of the pipe corresponds to the relative rpm of the engine.

There is no optimal length for every situation, since there are so many variables to consider: gear ratios, temperature, fuel, track conditions, etc. The goal is to get as close as possible to the best overall performance. Adjust the pipe by cutting off small portions of the manifold and reattaching the pipe. Never cut the pipe itself.

Top-end performance will increase as

the manifold is shortened. When the gains begin to diminish, the pipe is at its peak top-end length. Occasionally, the manifold will fit inside the opening of the pipe, but never insert the pipe more than $\frac{3}{8}$ inch. If the manifold interferes with the pulse-back, it may cause the engine to overheat or pre-detonate.

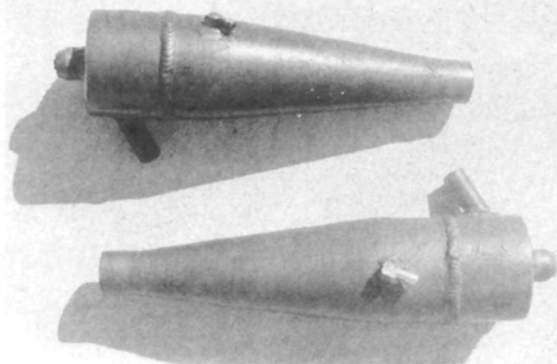
"One of my pipes, the AL-650, seems to be extremely strong through the mid-range without sacrificing any top-end," said Ron. "The shorter you get that pipe, the better it works. In fact, it's so strong—especially with the Picco engines—that I've been working on a new 'Stiletto'-type European pipe that has excellent top- and bottom-

end, without sacrificing too much mid-range."

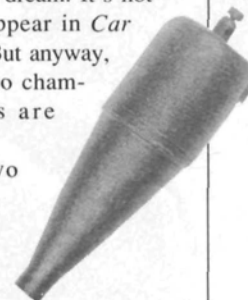
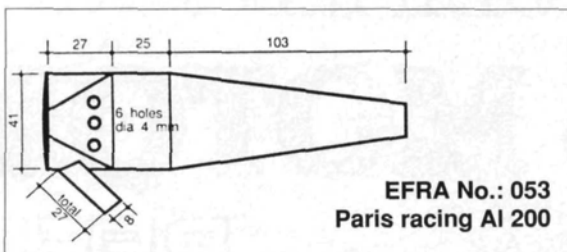
"If I didn't know better, Ron, I'd swear you were trying to plug one of your products in my dream. It's not like it's going to appear in *Car Action* or anything. But anyway, explain what the two chambers in the pipes are all about."

"There are two chambers in all racing pipes," Ron said. "The first does all the work. The second basically just captures the exhaust gases and vents them out through the stinger. In the past, there were single-chambered pipes, but they were considered too noisy. The two-chambered pipes are generally quieter, but they're more expensive to manufacture. The first chamber usually has a large hole at the end of the tapered rebound cone, or a series of smaller holes in a radial pattern. Back pressure in the first chamber (created by the gases trying to escape the pipe) can also be important to the engine's performance. Too much pressure can

(Continued on page 170)



The Paris AL200 (above, bottom) and AL650 (above, top) are two of the most popular pipes. Although it's hidden by the second chamber, the first chamber cones inward near the point where the weld is, and six radial holes vent the exhaust.



It won't be long before pipe manufacturers develop smaller versions of their 3.5 pipes for 1/10-scale gas cars.



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NITRO NEWS

(Continued from page 136)

cause the engine to lose power, and too little back pressure will impair the pulse-back and allow unspent fuel to escape. Very few racers consider how the exhaust exits the pipe. A body that hangs over the stinger can cut engine performance by as much as 10 percent.

"In Europe, pipe technology is closely monitored by the sanctioning body, EFRA. All pipes must be 'homologated,' which is a fancy word for saying registered, or checked, to ensure that they're available to all racers. The EFRA number is clearly stamped in all pipes by the manufacturers."

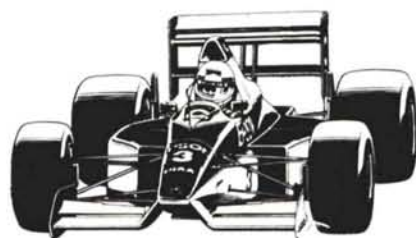
"What about pressure fittings," I asked. "Where is the best place to locate the fitting,

and how does it affect engine performance?"

"The pressure fitting for the fuel system," he said, "is most commonly placed where the pipe's diameter is the largest and, therefore, the pressure is the highest. If the pipe has a flat section in the center, place the fitting away from the inlet. Occasionally, racers place their fittings in the second chamber. There's reduced pressure there, but it seems a little more consistent. Most pipe manufacturers leave the fitting separate; it's very easy to install. The extra fuel tubing we use—roughly 18 inches—regulates or softens the pulse before it reaches the fuel cell. If too much of the pressure pulse reaches the tank, it can cause tuning problems."

"Well, that just about wraps it up, Ron. Is there anything else you want to tell me?" As

I waited for his reply, a fog moved in over the beach and a strange noise interrupted my thoughts. The noise got closer. It sounded like a horde of natives approaching through the jungle...it sounded like a stampede of elephants...it sounded like—my alarm clock!



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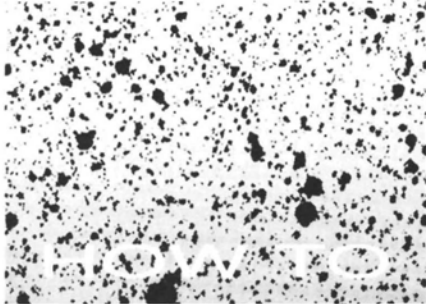
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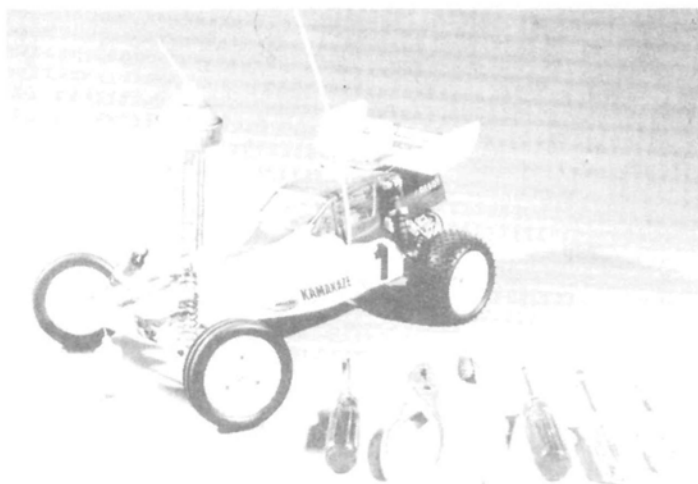


CLEAN

Your Off-Road Car

by MIKE LEE

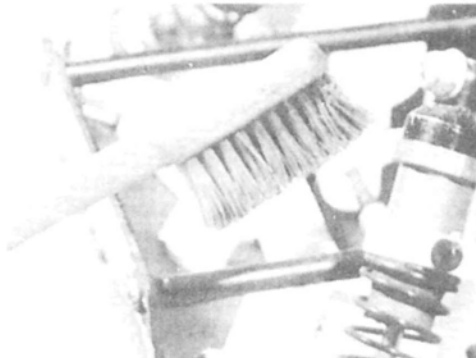
keep it clean, make it scream



The recipe for cleaning your car: one dirty car, the tools needed to take it apart, and the proper cleaners and oils to service it. The result is a car that runs more efficiently.



Use a toothbrush to get the dirt out of the suspension arms, the hinge points and all the crevices. You might have to disassemble the suspension arms to reach the deep-down dirt.



Knock off as much dirt as possible with the toothbrush, especially around the shock towers and suspension arms. If the suspension is full of dirt, it can't do its job.

KEEPING YOUR car clean and in tip-top condition is the key to its longevity. A car that makes crunching noises at every joint can't possibly work as well as a clean car that has smooth-working joints. Off-road cars and trucks get into the tough stuff most often, so let's look at the basics of how to keep them clean.

First, gather the correct tools. You'll need tools to remove the wheels, axles, shocks and suspension components; and be prepared to tear down the tranny. You'll also need cleaning spray, a toothbrush, a cleaning rag and oil. Then, spread some newspapers on the floor, and

get ready to work!

• **Body.** I start with the obvious stuff. Take the body and the wheels off the car, wash the body with water, and dry it off. If you want it to shine, wax the body with the same stuff you use on your automobile. It works well, and the body will be easier to clean in the future.

• **Tires.** Rinse the tires with water, and use a small nylon-bristle brush to remove mud from the tire treads. If there are vent holes in the rims, make sure that you drain any water from them. Dry them off, and set them aside. If you want the tires to look shiny, spray them with Armor All.

Pay special attention to the shocks. This shock might not look dirty, but a close look at the ends of the piston rod shows a buildup of dirt and oil. This could ruin the seals in no time.



• **Chassis.** I remove the motor and then start chasing the dirt out of the chassis. Use an old—presumably retired—toothbrush to get the dirt out of the suspension pins, joints and linkages, and from around the shocks.

• **Shocks.** Always keep the shock bodies clean; dirt that piles up on the piston shaft will carry through to the seals and eat them up. If that happens, you'll have to rebuild your shocks much too often. Check the O-rings, the shock cartridges, the shafts and the pistons for damage, and replace them if necessary. Don't forget to replace the shock oil. If you can't remember when you last changed the oil, do it now. You certainly won't hurt anything by changing it.

• **Axles.** Set the shocks aside, and inspect the axles—particularly the drive axles. It's here that dirt can do real damage to the bearings, the drive cups, the universal joints and the axle itself. If you find any dirt at all, spray it out with motor spray. Be careful: do this outside, and use eye and hand protection. For best results, add lubricant to the moving parts after you've cleaned them.

• **Suspension arms.** Before you put the shocks back on the suspension, check the suspension arms. Make sure that they move

freely through their full range of motion. Watch for binding and/or "crunchy" sounds. If there's any hint of crunchiness, tear down the suspension by removing the hinge pins.

Spray a couple of shots of motor spray through the joints to remove the junk, and then wipe down the hinge pins. Check for damaged hinge pins or suspension arms, and replace them if necessary. Reassemble the suspension and check the movement again. It should be nice and free this time. Don't settle for less here; this is an important step. The suspension has to work or the rest of your car won't.

• **Tranny.** The differential movement should be smooth as silk—no harsh noises or binding! If the diff action isn't smooth, rebuild the diff and tranny. Most of the time, the diff might need adjusting; quite possibly, you'll have to replace the diff rings and the diff balls.

You might have to pay a few bucks for new balls and rings, but this will improve reliability and handling. When I detect a problem with my diff, I immediately replace the diff balls and rings. Change both rings—not just one. It's too difficult to tell which side of the diff is worn. When in doubt, throw them both out!

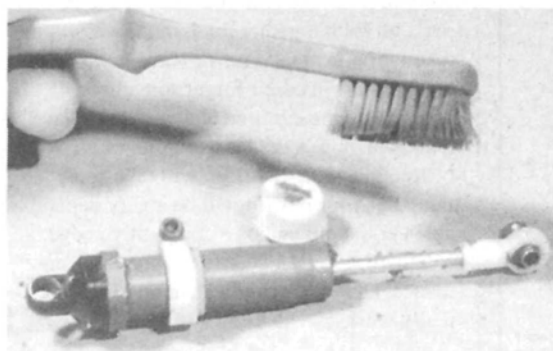
BEARING CLEANERS

If your car's bearings don't roll like they did when they were new, or if they make a funny "crunching" sound when they roll, then it's time to clean them! There are several bearing cleaners—Robinson Racing's* bearing cleaner, and Cheetah Racing's Bearing Blaster* are just two—that do a good job of removing the gunk from the inside of the bearing. Just put the bearing in the canister and blow its brains out with motor spray. When you've finished cleaning, apply a good lubricant to the bearing. Don't forget to use one that's made specifically for ball bearings; it won't gum up the inside of the bearing. I use Banana Lube from Dan's RC Stuff*; I just add a drop and reinstall the bearing!

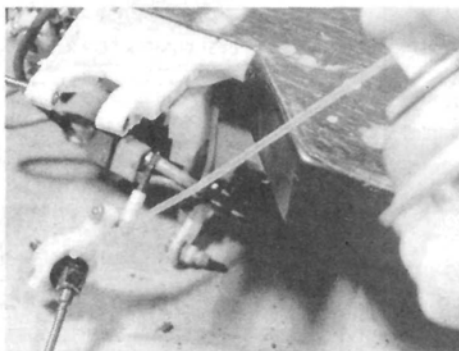


To prolong the life of your bearings, keep them clean and well-oiled. Use a bearing cleaner, such as this one by Robinson Racing, to simplify cleaning.

• **Steering components.** Reassemble the tranny and put it back into the chassis. Then, replace the suspension arms and



Use a toothbrush to remove dirt from around the piston rod. This is an easy—but critical—job that could make the difference between winning and losing.



Motor cleaner can be used for more than just motors. Here, I clean out the universal joint and the support bearing. Don't forget to follow up with high-quality bearing oil.



We've already talked about cleaning motors. Here are the tools that you'll need to do the job correctly. This motor stand—from S&K Racing*—helps you to perform the job quickly.

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CLEAN YOUR CAR



Left: keeping your bearings clean prolongs their life and improves performance. Right: always lube the bearings after cleaning them. Use a high-performance bearing lube.

remount the shocks, the axles, the wheels and the tires. But you haven't quite finished yet. Check out the steering components. Make sure that the steering arms, the pushrods and the suspension rods move without binding or crunching. Remove any dirt you find. While you're at it, check the ball joints for wear or damage, and check all the joints for missing E-clips. Replace the clips as necessary.

• **Motor.** We've spoken a few times about proper motor maintenance (see the April '93 issue of *Car Action*), so I won't repeat those details. Clean the motor thoroughly with motor spray, and oil the bearings or bushings when you've finished.

By the way, did you know that most off-road motors are trashed because they need oil? Most of you guys forget that there's a motor bushing under the spur-gear cover that needs oil every time you run.

Finally, reassemble the car. Make sure that everything is in the right place and is tightened correctly. If you forget how the parts go back together, look in the kit's instruction manual. I never leave home without one, just in case I forget something. If you bought the car used and you don't have a manual, now's the time to order one.

Keeping your car clean will take some time, but your reward will be a very dependable car that maintains a competitive edge. Run hard, run fast, and, for the best performance, keep your car clean at all times. It really works!

*Here are the addresses of the companies mentioned in this article:

Robinson Racing Products, 4968 Meadowview Ln., Mariposa, CA 95338.

Cheetah Racing, 10823 Amestoy Ave., Granada Hills, CA 91344.

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For the first time both stock and modified motors can be tested and evaluated at loads up to 30 amps. Direct correlation between motor and track can be accurately determined, and motor can be optimized for best achievable performance.



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- Ideal for both stock and modified motors
- One year limited warranty
- Can be used with Ni-Cd batteries
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